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BRIEFLY TOLD.

THE ORGANIZATION OF A LIGHTING ASSOCIATION FOR THE LONE STAR STATE.—The JOURNAL's readers have been advised of the progress of the movement for the formation of an Association that would fairly and properly represent the interests of those engaged in the legitimate supply of artificial light to the people of Texas, and it is with satisfaction that we now chronicle the successful completion of the initial purpose. The meeting for organization, which was held in Houston on the day (May 22d) named in the provisional circular, was harmonious and successful, and the result was the permanent organization of the Texas Gas and Electric Light Association, which body cannot fail to do much for the advancement of artificial lighting in the biggest of the States. In due time we will fully report the proceedings of the organization meeting, and meanwhile we print the following letter from Mr. W. E. Holmes (to whose pertinacity and attention to preliminary detail the formation of the Association must be largely charged), as an earnest that the artificial lighting suppliers of Texas mean to stand by each other:

"AUSTIN GAS LIGHT AND COAL CO.,
"AUSTIN, TEXAS, May 25, 1895.

"To the Editor AMERICAN GAS LIGHT JOURNAL: The meeting of the Texas gas and electric men, at Houston, May 22d, resulted in the organization of the Texas Gas and Electric Association, with subscriptions from 25 active and several associate members. The Secretary (Mr. Homer Starr, of Gonzales) was instructed by resolution to send the AMERICAN GAS LIGHT JOURNAL, and other publications and newspapers, a copy of the vote of thanks passed to each of them, for kindness and assistance in forwarding the movement; also to the Secretaries of the older Associations and Societies for copies of their respective constitutions and by-laws, and other printed matter; also to send copies of proceedings to each of the publications mentioned. In this connection permit me to express my earnest appreciation of, and thanks to the AMERICAN GAS LIGHT JOURNAL for your hearty assistance in this movement. We will always have a warm, kindly feeling for the JOURNAL, and a hearty welcome for its editor, if he will pay us a visit at any time. Although our organization has been much more successful than any of us at first expected, or even hoped for, we are not going to rest on our oars; quite the contrary, committees have been appointed, who are even now planning to make our first annual meeting (May, 1896), an entire success from every point of view.—Yours very truly, W. E. HOLMES."

Of course, it is quite unnecessary to say that we fully appreciate this genuine acknowledgment of anything we did to further the formation of the Texas Association, and the members thereof will rest assured that our best service is at their command to honestly and sturdily advance the purposes for which they meet in mutual consultation.

THE WISEACRES AT RICHMOND, VA.—With great regret we last week reported the death of Mr. W. C. Adams, whose services in connection with the municipal gas works of Richmond, Va., covered a period of all but 30 years. Beginning in a subordinate's position with the plant in 1866, he so adapted himself to the circumstances of his place that death found him at the highest point possible of attainment in the levels during which his working days were passed. Grudgingly was his compensation

advanced, until the municipality, but only after tearful protest, finally awarded to him for his faithfulness and skill the salary of $3,600 per annum; and, considering the adverse potentiality of changes in political administration, no other gas engineer in the country had less chance to show what could be done by him in the development of his charge than had Mr. Adams. Under private or ordinary commercial control the engineer of a plant sending out 250 millions cubic feet per annum would have only to ask for the sum necessary to keep the works in fair physical condition; whereas the Richmond works, under municipal control, despite the repeated requests of the engineer, were not allotted the sum requisite to enable him to show his knowledge and their possibilities. However, the gas engineers of this country who watch the progress of their industry with anything like close scrutiny are sufficiently aware of the conditions existing at Richmond not to require much criticism thereof at our hands; but we imagine they were not quite up to the point of expecting a result the like of which seems to be impending there. To put it bluntly, the salary received by the late Mr. Adams was $3,600 per annum, and the Board of Aldermen are seriously considering, in fact are so moving, to fix the salary of whoever may be his succ essor at $2,500 per annum. It is not of moment who shall assume charge at Richmond, but it is of grave importance to the users of gas light there whether they shall have to pay a double tax; for now they pay directly the cost of all the public lighting by gas of the city, and are threatened, if an incompetent engineer is to be put in charge of the works, with the imposition of a second tax in having to pay the old figure for an inferior article of gas. The Richmond *State*, we are glad to say, is animated by a spirit of independence up to the point of declaiming against this evidence of imbecility on the part of the Aldermen, as witness the following from an editorial in its issue of May 23d: "It is certain that up-to-date gas engineers in the United States are not to be had for cities of the population of Richmond for any such salary. The private gas corporations get them and hold them at salaries ranging from $4,000 to $10,000 a year. Such corporations go in for getting the best man, and they are always on the hunt for the best man. Citizens of Richmond are vitally interested in having an expert man in this position, because it means better and cheaper gas. A poor quality of gas means more of it burned and bigger bills. * * * A move to reduce a city official's salary is never wanting in popularity with many people, but this instance calls for great care before such a move is made. Richmond, in filling an office like this, should not only have a good man, but the best man, even if it has to hire him from some other city and pay him $4,000 or $5,000 salary. It would be money well invested from the dollars and cents point of view. There is always a best man for such places, and the best offer gets him." The *State* names the facts which bear on the case very tersely and very truthfully, and we hope that reason and right will eventually rule with the Board when they determine this important matter.

THE OSIUS AND CASE PAPERS.—Our current instalment of the proceedings of the Pittsburgh meeting of the Western Association is brimful of interest, but perhaps the chapters which will attract the most attention are those which hinge upon the papers submitted by Mr. Osius and Mr. Case. These papers are devoted to the consideration of subjects which are eminently practical, although neither has received that attention from the fraternity which its intrinsic merit deserves. Every maker of coal gas can find much to think about in the recovery and rational first handling, or saving, of ammoniacal liquor, and it looks to us that a careful reading of Mr. Osius' presentation of the subject will arouse a sufficient spirit of inquiry, without further comment by us. A like verdict may be rendered in respect of Mr. Case's remarks anent the introduction of gas engines to users of power, and perhaps his story will interest a wider circle, since, unlike the Osius subject, Mr. Case's presentment appeals with equal force to gases howsoever made.

NOTES.—Messrs. Chas. A. Rolfe, Otis W. Bruner and Andrew Hummeland have incorporated the Blue Island (Ills.) Gas Company. It is capitalized in $100,000. This place is about 15 miles south of Chicago. It is crossed by three railroads, and has a population of perhaps 3,800. ——On and after July 1st the net rate for gas sold by the Cambridge (Mass.) Gas Light Company is to rule at $1.25 per 1,000 cubic feet. We also have the pleasure of reporting that Mr. Adolph Vogel, the Treasurer of the Cambridge Company, is back again at his desk, completely recovered from his recent serious illness. ——The Directors elected at the annual meeting of the Jersey City (N. J.) Gas Light Company were: Hamilton Wallis, Freeman A. Smith, S. H. Plum, Miles Tierney, John D. Carscallen, W. B. Jenkins, C. Zabriskie, C. S. Jenkins and C. K. Murray.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 772.]

EIGHTEENTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

HELD AT PITTSBURGH, PA., May 15, 16 and 17, 1895.

FIRST DAY—AFTERNOON SESSION.

The President—Mr. F. L. Slocum, of Pittsburgh, Pa., will read the following paper on

ACETYLENE.

History.—Acetylene (C_2H_2) was first discovered and isolated by Davy[1] in 1837. He obtained it from the black mass produced in the manufacture of potassium. In 1858 Perrot[2] produced acetylene gas by the action of the electric spark on the vapors of alcohol and ether. Quet[3] observed that the gas formed by electrolytic action on ethylene gas in alcohol was taken up by sub-chloride of copper and chloride of silver, forming a very high detonating compound. In 1858–59 Berthelot made a much more thorough examination of acetylene and its compounds, and established its properties in general.

There are many ways of producing acetylene, such as passing hydrogen between the poles in an electric arc or by exposing marsh gas or coal gas to a very high heat or an electric spark; but up to within a recent period the most practical way of producing acetylene was by the incomplete combustion of coal gas, as, for example, in the case where a Bunsen burner strikes back and burns inside the tube. The acetylene, which is always formed by the incomplete combustion of hydrocarbons, is, in this case, only partially burned, and can be collected in a solution of sub-chloride of copper, with which it forms an insoluble compound—$C_2H_2Cu_2O$. This material, when dry, is very explosive and difficult of manipulation, hence acetylene up to the present time has been very difficult to produce in quantity in a pure state. In 1862 Woehler[4] produced calcium carbide by heating a mixture of lime, zinc and carbon to a white heat. He found that the black mass formed would liberate gas when brought in contact with water. He tested this gas in the usual way, proved it to be acetylene, and promised, in a very short article which he wrote on the subject, that, in the near future, he would give a detailed analysis and full description of this method of producing acetylene; but Providence decided otherwise, as the Doctor died shortly afterwards and never finished the work he had in mind. From that time until last year the production of acetylene, when wanted for experimental purposes, has been produced by the old method—the incomplete combustion of hydrocarbon gas. In 1893 H. Moissan[5] produced calcium carbide, but did not make a thorough examination of same.

In 1894[6] he produced calcium carbide by the action of the electric furnace on lime and carbon. The examination and analysis showed that its composition was CaC_2. Moissan is, therefore, the real discoverer, after Woehler, and the first discoverer of the production of calcium carbide in a commercial way. Moissan has been experimenting for years with the high temperatures produced by the electric furnace, and has made many very valuable discoveries, especially the production of carbides of different elements; as, for example, he has lately produced a very pure carbide of aluminum, which, when brought in contact with water, produces marsh or natural gas (CH_4)- $Al_4C_3 + 12H_2O = 3CH_4 + 2Al_2(OH_6)$. This is very interesting, as it is the first practical indication of the real sources of petroleum. The large amount of work that has been done with the high temperature of the electric arc shows that a whole series of carbides existed when higher temperatures were obtained than those within the present reach of human means, up to the time of practical operation of the electric furnace. In former ages large masses of more or less pure oxides of different elements could have been brought in contact with carbon at very high temperatures, forming carbides. These carbides were deposited in the lower and heated measures of the earth's crusts, and, as they gradually cooled, water, in the form of steam under enormous pressure, was brought in contact with them, producing many of the different hydrocarbons now found in nature. Moissan has lately made some nitrite compounds of different elements, which, when brought in contact with water, produced pure ammonia. These are mentioned especially to give an idea of the range of this class of compounds, if a certain temperature can be obtained and maintained in any quantity. There have been within the

1. Liebig's Annalen, vol. 23, p. 114.
2. Liebig's Annalen, vol. 108, p. 114.
3. Liebig's Annalen, vol. 108, p. 116.
4. Liebig's Annalen, vol. 124, p. 220.
5. Compt. Rendus, vol. 115, p. 1,031.
6. Compt. Rendus, vol. 116, p. 1,222; vol. 118, p. 501.

last eight months numerous articles in the various technical journals as to the cost of the production of acetylene, and the gas fraternity in general have been very much agitated by at least some of these articles, which would lead the reader to believe that acetylene was cheaper than daylight. Acetylene, or rather calcium carbide, has as yet not fulfilled the assertions of many of the articles written, and is not at present on the market at daylight prices.

Properties.—Acetylene (C_2H_2; Molecular weight, 25.94; C = 92.31 per cent.; H = 7.69 per cent.) is a colorless gas, having a peculiar, disagreeable and penetrating odor. Its specific gravity is 0.91 observed and 0.89829 calculated. It is gas at all ordinary temperatures and pressures. Its critical point is at 37.05° C. and 1,000 pounds pressure. Above this temperature the gas cannot be liquefied, and is governed by the laws of permanent gases. At a temperature of 1° C. and 706 pounds it is a liquid. When liquefied it is mobile, colorless, highly refractory and lighter than water, and is a very strong solvent of fats. One litre of acetylene weighs 1.16148 grains; one cubic foot weighs 507.5338 grains, or 0.07255 pounds; 1,000 cubic feet weigh 72.55 pounds. It has a heating capacity of 11,923 heat units in Centigrade and Kilo systems. Its heat value, pound for pound (carbon = 1), is 1.48. Its heat value, volume for volume (hydrogen = 1), is 4.53.

The most interesting property of acetylene to the gas manufacturer is its extremely high candle power, being 240 candles, with a consumption of 5 cubic feet of gas per hour. The comparisons of its luminosity with that of other well known compounds, as made by Prof. Vivian B. Lewes, are as follows, all based on an equal consumption of gas—viz., 5 cubic feet per hour:

Methane	5.2 candles.
Ethane	35.7 "
Propane	56.7 "
Ethylene	70.0 "
Butylene	123.0 "
Acetylene	240.0 "

Calcium carbide (CaC_2), a bluish-black, solid, crystalline, brittle mass, having a specific gravity of 2.22, can be heated to a red heat in an atmosphere of nitrogen without decomposition, but is immediately decomposed when brought in contact with water into calcium hydrate and acetylene. The reaction is as follows: $CaC_2 + 2H_2O = C_2H_2 + Ca(OH)_2$. As stated above, this interesting compound was first discovered by Woehler, and its practical production by use of the electric furnace by Moissan. There has been a great deal written in the last few months in regard to the cost of calcium carbide: Willson has put the price at $15 per ton, others at $40, and still others at $100, and so on. In this country and in Europe there have been formed numerous companies, both large and small, to promote and further the industry of gas manufacture by means of calcium carbide, but as yet there is but very little calcium carbide on the market. The writer is interested in a business where we have an electric current of sufficient voltage and amperage, and a furnace of sufficient capacity to produce calcium carbide in very large quantities. We have given some time to the production of this material. We find that the arc works entirely on resistance, and that the mass, before combination and after, is almost non-conducting; therefore, the production of carbide must be exceptionally small for a given amount of current. Nearly all the calculations that have been published have been theoretical, and of little use in estimating the real cost of the maufacture of calcium carbide. The Aluminum Industrie Actien Gesellschaft, in Neuhausen, Switzerland, who are exceptionally well located for the manufacture of this material, are advertising it at 5¼ cents per pound. This is 14¼ cents per pound for acetylene contained therein. As acetylene weighs 72.55 pounds per 1,000 cubic feet, this would make it cost the consumer $6.20 per 1,000 cubic feet.

From our experience in the manufacture of calcium carbide in a large way, we believe this to be a fair selling price, giving an ordinarily fair manufacturer's profit. Assuming this to be the case, the acetylene question, so far as the gas manager is concerned, for the use of enriching or illuminating, becomes of little interest. There is, however, one use to which acetylene can be put by the gas manager, even at its present price, which makes it of extreme interest to the manufacturer of any kind of gas for lighting purposes throughout the whole civilized world, and that is its use as a light standard or unit. For the measurement of light it is apparently the perfect standard for a light unit, as the requirement for an absolute standard of light is a gas which can be produced always in a like state of purity in all parts of the world, preferably by means of decomposition of a substance in water, so that at a given temperature the gas will always contain a certain percentage of moisture. This gas must be a definite compound, and be composed of the illuminating principle itself. It can then be burned at a certain speed and height through a specific gravity tip burner, and thus always give, constantly and exactly, an even and constant amount of light per unit of time. Acetylene manufactured from calcium carbide fills each and all of these conditions. In a recent very interesting paper by Professor Lewes he showed quite conclusively that acetylene was the luminous principle in all hydrocarbon flames. Therefore, only acetylene, when burned in its pure state, would be able to give a constant luminosity. The apparatus necessary for the production of sufficient acetylene for light unit uses on the photometer is very simple. All that is required is a small holder in which the gas is taken from the top, working in a tank in which it can be sunk entirely below the water level. A small enlargement is made on one side of the holder basin, passing to the bottom, and of sufficient size to allow a wire gauze holder about 2 inches in diameter to be passed to the bottom and under the holder. The amount of calcium carbide necessary is then wrapped in the wire gauze, pushed down under the surface of the water, and the acetylene gas allowed to escape for a few seconds, or until all the air is removed from the mass, and then it is passed to the bottom and turned underneath the holder and held there until the holder is sufficiently full. The holder is then allowed to stand until the temperature of the water is constant and near 15° C. The percentage of moisture in the gas has then become constant. The gas is burned under a given pressure through a special tip, the same that is used for specific gravity determinations by diffusion. The writer anticipated giving the results of tests with photometric measurements, in comparison with normal candles, but has been unable to do so, and reserves this for a future publication.

In regard to the future of calcium carbide. There seems to be little hope of its general use as a competitor of coal and water gas. Its chief uses will likely be in lighthouse work, isolated lighting plants, possibly in car service, in the use for light unit and special purposes where other gas is not available, or where extremely high candle power gas is necessary and the present price is not prohibitory. It is going to be an industry that will gradually grow, and it is possible the production of carbide will become much cheaper than at present, although there is no indication of any great cheapening in its manufacture, from our present knowledge. Its use will likely be very extended in the general technical world; in fact it is of far more interest in the numerous branches of organic chemistry than in the field of gas making.

In regard to its transportation in quantity. It is best shipped in cans, tightly sealed. There has been a company formed in Philadelphia to manufacture acetylene and compress it in cylinders in a liquid form. This seems very much like "carrying coals to Newcastle," as a ton of calcium carbide will yield over 750 pounds of acetylene, and it is certainly much more convenient and in much smaller space than if acetylene gas were compressed into cylinders. The cylinders would necessarily have to be about the same as those for the transportation of carbonic acid gas, as the critical point of the two gases lies at about the same temperature. It would, therefore, require about 40 cylinders to transport the equivalent of one ton of calcium carbide, and the danger of explosions with liquefied acetylene would be very great. It is not a question of what to do with acetylene, or how to produce it, with the gas manager, but it is a question of "How cheap can I buy calcium carbide?" and, as yet, calcium carbide cannot be produced at a figure which would make it available for any ordinary uses in the manufacture of gas, and the state of the art does not indicate that it will for a long time to come.

At the conclusion of his paper Dr. Slocum gave an exhibition of the lighting value of acetylene, burning the gas through 1, 2 and 3-foot tips.

Discussion.

The President—We have listened to a very interesting paper, and would like to hear from some of the members on this subject.

Mr. Greenough—I think there is a great deal to interest us in that paper. The writer seems to have approached the question of cost from the most sensible point of view. I would like to ask Mr. Slocum, with regard to the figures he gives us here, for it seems to me they do not correspond exactly in the book; but perhaps it is owing to a misprint. He says that the cost of the calcium carbide would be 5½ cents per pound. That, as I figure it, would be $110 per ton; and that would make the cost of 1,000 cubic feet $11, and not $6.20, as stated by him. Figuring, as he says afterwards, that it would be 14¼ cents per pound for acetylene, and estimating that it would weigh 72½ pounds per 1,000 cubic feet, then 14¼ cents per pound would make the cost $10.70 per 1,000 cubic feet.

Dr. Slocum—That is a mistake in the calculation. The 14¼ cents per pound for acetylene is all right, but the $6.20 per 1,000 is wrong.

Mr. Greenough—Then it would be $11 per 1,000 cubic feet instead of $6.20?

Dr. Slocum—Yes.

Mr. Thompson—Then will Mr. Slocum kindly read as it should be the paragraph he is talking about?

Dr. Slocum—Wait until I make the calculation again and figure it over. The selling price is 5½ cents per pound. That is 14⅛ cents per pound for the acetylene contained in the calcium carbide. As acetylene weighs 72.55 pounds per 1,000 cubic feet, that would make it cost the consumer $10.69 instead of $6.20 per 1,000 cubic feet. There is a mistake in the calculation.

Mr. Greenough—This does not in any way detract from the value of the paper; and I wish to compliment Dr. Slocum upon the care and attention he has given to the matter; and I move that he be given a vote of thanks for it.

Mr. E. C. Brown—Before that motion is put may I be allowed to ask Dr. Slocum a question or two. There has been a good deal said about carbide of calcium in the last few months, and some questions have arisen which I do not think have been satisfactorily answered. As Dr. Slocum is a practical worker in that line, I would like to ask him if the process involves the use of fire around the crucible, or does he rely upon the current to maintain the fusion in a heavily lined smelting furnace?

Dr. Slocum—We have methods of using both—with the gas around the crucible and without it. But the temperature around the furnace, in the case of the calcium carbide, is only an auxiliary heat; it is not a melting heat. The lime and the carbon, before this formation of the calcium carbide, have a slight amount of conductivity, but it is very slight on account of the non-conductivity of calcium oxide (CaO), it being nearly one-half lime, so that there is practically no conductivity at the very beginning. As soon as the calcium carbide is formed, there is practically no conductivity in the mass, especially at the point of fusion. Consequently the current works down through, almost unresisted, as if the lime and carbon were not there; it is but slightly affected, and you have got to work right down through on resistance. You can use a bundle of ordinary electric light carbons in order to get the greatest work out of the furnace, and so that you can pass through all the materials underneath. And then, when you do get it formed, it is exactly like slag; it is a great deal harder to handle than the slag from steel, because the steel slag runs easier than the carbide. Consequently you have in this carbide a nasty stuff to handle. It is hard to get your mass formed, and it is hard to handle any reasonable amount. This all costs, especially when you cannot get it to move fast. Therefore, the formation of it in large quantity is very difficult in the electrical furnace as now constructed. Now, if the current in going through from the positive to the negative pole does not come in contact with any calcium and carbon on its way to the regular pole and convert it, it is gone, and the force is lost.

Mr. E. C. Brown—Perhaps you can also tell me what is the latent heat of evaporation and the specific heat of acetylene?

Dr. Slocum—I have not got the figures here.

Mr. Clark—It seems to me we ought not to congratulate ourselves that acetylene is a high priced article. Gas men have been very prone, I think, in the last three or four months, to wish that it might prove to be a high priced article. But it seems to me, if we could welcome the production of acetylene on a commercial scale it would do us as much good as any other improvement possible in the production of gas. Certainly, if there is any benefit to be derived from the production of acetylene on a commercial scale, it would be derived by gas companies. Has Dr. Slocum's work been done with the direct or with the alternating current? And will he tell us what difference there is in point of economy between the use of the direct and the alternating current?

Dr. Slocum—Our work has been entirely done with the direct current. We have done no alternating current work whatever. We also were very much in hopes that acetylene would prove a commercial article, and we tried very hard to make it so. I think we are in a position to manufacture it as cheaply as anyone away from Niagara Falls. The Pittsburgh Reduction Company have been working at it at Niagara Falls, and their Company have also been working at it; but they are not any better satisfied over their results than we are with ours.

Mr. Humphreys—Dr. Slocum refers to the fact that he expects to do some more experimental work in the line of employment of acetylene as a photometrical standard. I think anything we can say to encourage him in that direction we ought to say. It is manifest to all of us how desirable it is to have a new standard of light. While I am not by any means of those who claim that the candle is absolutely valueless as a unit of measurement in photometry, still I think we ought to be able to improve upon it; and it would seem here might be a field for most valuable work for all of us; and it is something that we can afford to welcome. As to whether we should as gas men in general welcome the production of acetylene on a commercial basis I am in doubt. It depends upon how carefully it is covered by patents, and who owns them.

Mr. McElroy—I wish to say, with regard to Dr. Slocum and his experiments, it is not his fault that he has not been able to demonstrate that acetylene would be produced on a commercial basis. He was willing, but the flesh was weak, and he had not the time. I know that his time has been fully occupied. I could not go into my office to use the photometer but I would find him busy, night and day. He has been working at night to complete the experiments, but he could not do it. So I think he ought to be thanked for what he has done.

Mr. Humphreys—I second Mr. Greenough's motion that a vote of thanks be given to Dr. Slocum for his paper, and for the attention he has given to this subject. (Carried.)

The President—We will now hear the paper by Mr. James T. Lynn, of Detroit, Mich., on

EXPERIENCE WITH FOUL GAS.

There is probably nothing more distasteful to the average gas man than the knowledge that he is passing sulphureted hydrogen to his consumers in a proportion such as to cause annoyance and consequent complaint. There are but few of us who have not met with this difficulty, and very often too have found that such trouble has been the result of faults very difficult to locate. I can conceive of no better method to assist others to whom such experience may come, than to cite an occurrence of some years ago, which came to my attention while engaged as general utility man about a gas works.

The plant referred to had practically been allowed to take care of itself for some time before the new superintendent had taken charge, and one of the first discoveries made was that the gas was so foul that it was almost an utter impossibility for citizens to hold meetings in halls, theaters, churches or any other place where a large number of burners was in use. As the trouble was occurring in December there was no possibility of obtaining ventilation without considerable discomfort to the occupants of such rooms. Meters were ordered to be removed from private residences, as the large quantities of sulphur inhaled had caused a serious epidemic of coughing in every house in which large numbers of burners were in use. As this was prior to the days of electric lighting, it was a matter in which the city as well as the individual was interested, all public places and streets being lighted by gas. Matters had come to such a pass, indeed, that a committee from the city council had been appointed to investigate the trouble and report the results of their investigation to that body.

In our attempt to discover the origin of the trouble we first tested our gas at the purifiers, the paper remaining as clean after the test as it had been before, showing clearly that the difficulty was not the result of dirty material. A second test at the inlet of the station meter showed very evident traces of the objectionable sulphur, and thus indicated beyond a doubt that the cause of its presence was a leaking center seal. As soon as possible we removed the cap from this, cleaned all the joints thoroughly, covered them with tallow, and then replaced the cap. You can imagine the great comfort we derived from our discovery that this labor had neither removed nor lessened our difficulty. The gas remained as before, clean at the test cocks on top of the purifiers, and foul at the meter inlet.

Again we removed the cap, faced the joints with scrapers and replaced it, but found by testing that our former results remained unchanged. For the third time the cap was taken from the center seal, the water was entirely removed, and upon an examination of the divisions we found in one of them a crack extending from the bottom to within about one-fourth the distance from the top. Foul gas had been passing through the center seal to the meter, into the holder and on to the consumer. We realized that the removal of our old center seal and setting of a new one was to be no small undertaking at that season of the year, when the output was at the maximum limit. In fact, such work with a 12-inch center seal, and only one set of purifying boxes to rely upon, is never to be considered a trifling matter when one possesses a holder capacity equivalent only to the minimum consumption of one day. Necessity, however, often removes obstacles and converts timidity into boldness. At any rate, we settled down to work.

Immediately after the arrival of a new center seal, temporary galvanized iron pipe connections were made from the inlet pipe to our center seal, and the inlet of our most convenient purifier, also from the outlet of the latter to the pipes carrying our product to the station meter, which threw our remaining three boxes and center seal out of operation. We soon had the center seal and the old connections removed, new

foundations built throughout, our new seal placed, and all connections made again, this work being accomplished in the course of three days. During the time this was in progress we were compelled to change the material in the box which was in use each day. In order to do so we fired a couple of extra benches, and were able to close down our entire works for about three hours each morning. After our center seal was in position we broke the temporary connections with the box, connected the center seal and the remaining purifiers, filled them with material, recommenced operations, and then easily connected the other purifier with the seal. But this was not the end of our trouble. The former condition of affairs had existed for such a length of time that the water in the station meter had become impregnated with sulphureted hydrogen. This water was taken out and the meter refilled. This was a small matter, and a test of the gas between the purifying apparatus and street governor showed no trace of impurity. It ran all day without showing any discoloration of the test paper in the glass, but with some surprise we found the next morning that foul gas had discolored it, giving evidence that such gas had passed into our street mains. This paper was removed and another placed in the glass, and as on the previous day it remained clear, but on the following morning was as black as the former one had been.

It annoyed us greatly to think that we had made pure gas during the day and foul during the night; so, upon the third night, the gas passing to the street mains was very closely watched. We found when the holder commenced to descend the paper began to discolor. This fact led to the discovery that the outlet pipe from the holder was being used as both inlet and outlet by the agency of an open by-pass valve, and that during the day, when our make exceeded our output, a sufficient supply of gas was sent to our consumers without entering the holder at all, but that, after the heavy consumption of gas came on at night and was in excess of the make, then, of course, the deficit was made up from the gas in the holder. The next morning, by means of a test made at a pillar cock placed on the crown of the holder for the purpose of testing, we were convinced that the trouble now existed here. We could not change the water in the tank as we had that of the meter, for at that time our daily output of gas was over 240,000 cubic feet, with a storage capacity of only 100,000 cubic feet.

The following plan of cleansing the water was devised: We had the cover of an old purifying box, about 10 feet square and 14 inches in depth; this we elevated about 6 feet above the water level of the holder tank by means of empty barrels, and filled it with a mixture of lime and water. Then we constructed a siphon of 3-inch pipe, about 8 feet long on one side and 3 on the other. Late in the afternoon, when the holder was filled to its utmost capacity, we would drop this siphon down alongside the holder, give it a quarter turn, then raise it up far enough to bring the inside siphon end above the water level, connect it with an outlet from the box, and by opening a cock run the lime water in from the elevated box. This process was repeated for several days until the water in the holder tank was entirely free from sulphur. Before lime water was introduced into the tank the water it contained was very dark, almost black, but as it became purified, and the sulphide of calcium formed by the chemical reaction was precipitated, it became so clear as to expose to view the guide rails and bolts for several feet below the surface.

After we had disposed of this embarrassment, it was concluded to examine the inlet to the holder. This had been by-passed for some years, owing to a leak which had filled the pipe so fast that it was impossible to make use of it. We pumped out the water and found that the leaks were all stopped, the inlet being now more nearly water tight than the outlet, which had for so long a time done the work of both. As the siphon had been used very near the inlet and outlet pipes, my opinion is that the lime had filled small holes left in the joints beneath the level of the water, causing these leaks; or that there had been small solid particles, capable of swelling by the action of water upon them, dropping into the tank at times during the years past and accomplishing the same result. At any rate there was no further trouble with foul gas, nor by too much water in the drip of our inlet connection.

This experience demonstrated to me that it was a good plan to have a by-pass arrangement between the inlet and outlet pipes of all gasholders. In the construction of two plants since that time I have followed this plan; but I would not advocate the use of this by-pass except in an emergency, because of the following facts: Where coal gas is made exclusively the candle power of the product is irregular, the illuminating power of gas made being variable between charges. In the manufacture of water gas the results obtained are just the opposite to those obtained from coal gas, the candle power of the gas being much greater toward the end of a run.

A very positive young man, engaged in the gas business as manager of a small gas works, with whom I came in contact a few years ago, remarked to me that it was not necessary for him to make frequent tests for sulphureted hydrogen. He explained his position by the assertion that he knew precisely the amount of sulphur the coal employed in his works contained, and also the exact length of time each purifier would continue to extract the impurity. I had that evening, while in a room at the hotel, my only experience with the product with which this young man was supplying his customers. I had scarcely lighted the gas when I detected a very visible odor of sulphur, and immediately wending my way to a neighboring drug store, purchased the necessary materials and returned to make a test at the burner. The result showed the presence of the objectionable article, which did not surprise me. It simply illustrated the fact that at least one young man's mathematics was not equal to a common and simple test. In explanation of the fallacy of his calculations, I may relate an experience then fresh in my mind, of two successive consignments from the same coal mines to the plant with which I was at that time connected. I found that the gas produced from the first excelled that from the second by over 3 per cent. in yield, 5 per cent. in candle power, and required but 70 per cent. as much material for purification, with heats and other conditions the same throughout the entire time.

In many small works throughout the country, especially where capital to make necessary improvements is wanting, the meagerness of the purifying capacity is the cause of considerable annoyance to superintendents and to consumers. It is apparent that in earlier years constructing engineers neglected, to a surprising extent, the erection of apparatus adapted to an increased production and changes in the condition of material. It is worthy of remark that more attention is paid to this important department at the present day, as may be readily seen by the following quotation from a well known constructing engineer of the present time, who, upon being asked what rule he followed in erecting purifying apparatus, replied, "As much superficial area per 1,000 cubic feet as a gas company's finances permit." Looking at the matter with open eyes and reasonable minds, the good common sense of that reply can be readily seen. The question of the superficial area of purifiers has been almost worn out in discussions and in books, and while much valuable material has been gathered upon the subject, rules are at variance and none are adapted to the possibilities of the future.

In order to avoid the ills arising from the passage of foul gas into our street mains, there are well-known remedies generally admitted but very frequently not adopted. At the present time of sharp competition we are compelled to satisfy the public, or suffer in consequence a decrease in our business; and while everything is going on smoothly at the gas plant and upon the street, alertness is the only key to security. The urgent demand for a pure article is an undeniable one, and the importance of frequent tests for sulphur is self-evident. Tests should be made not only at the purifiers, but also at some point between them and the station meter; and occasionally it might be found advantageous to make a test at a burner in the office or the home. By attending strictly to this matter one can always be positive in regard to the condition of his gas and of the apparatus in operation. Small imperfections are apt to present themselves at the most unexpected times, but if immediately discovered and remedied are not so troublesome as they would become under a system of neglect.

At the works of the Company with which I am now connected the manufacture of a pure standard gas is made imperative by the provisions of the charter under which we operate. Consequently, we subject our gas to a constant test for both sulphureted hydrogen and ammonia at the photometers, having three glasses in position, two of which are connected with our coal and oil-water gases between their respective purifiers and station meters, and the third making a test of our mixed gases on the passage from the holder to the street mains. By watching the test closely, and noting the most minute discoloration, the presence of the slightest trace of any undesirable impurity is readily detected in ample time to prevent all unpleasantness.

In writing this paper the thought that my own experience might be of some benefit to others presented itself. If I have succeeded in preparing some, to whom similar experiences are as yet unknown, to surmount an obstacle that may arise at some future time, and if in my effort to do this I shall have succeeded in interesting others more able than myself to participate in a beneficial discussion upon the subject, I shall feel that my object has been fully attained.

Discussion.

The President—Mr. Lynn's paper is likely to be of benefit to us, and I am sure he will be willing to answer any questions about the subject matter.

Mr. Jenkins—Some years ago I had a very similar experience to that related by Mr. Lynn. The only difference was that I did not have any defective center seal. I found on taking charge of the works that they had allowed unpurified gas to pass from the works into the streets for several weeks previous. I had made quite a number of tests. I knew that my gas was right when going into the holder, but had not tested it going out. A civil engineer took the trouble to test it, and called my attention to the fact that the gas was no better after I had been there six months than it had been before, and so proved that I was a failure. I looked the matter up and found that the water of the gasholder was so very foul that you could send absolutely pure gas into the holder and as it would come out it would discolor the test paper right along. We were more fortunate than Mr. Lynn, however, for having two holders, we emptied the tank, putting in fresh water, and had no further trouble.

Mr. Butterworth—I would ask Mr. Lynn if he could not have temporarily packed that crack in the center seal, making it in that way temporarily tight, and thus get along until summer time, when his works could be repaired. On page 6 he says that the rule for erecting purifying apparatus is that it should be by the "superficial area per 1,000 cubic feet." I think that what he means is the cubical contents of the box. The superficial area is not what we are after; it is the cubical contents.

Mr. Lynn—In regard to packing the crack in the center seal, on the divisions in the center seal, as every person knows who knows anything about the casting of center seals, the strain is very great; and if you attempt to pack a crack in any division of a center seal, you are liable to crack it all the way up. It does not take very much of a strain on such castings, in addition to the strain which is naturally on them, to break them; and any caulking you might attempt to do on them would simply extend the crack to the point probably of causing it to crack all the way up.

Mr. Ferrier—On page 5 Mr. Lynn mentions an experience with two successive consignments of coal from the same mine, and states that the gas from one required but 70 per cent. as much purifying material as from the other. I wish to ask if this was at the same time of year, so that the gas was passed at the same rate through the purifiers, and at the same temperature, in both cases.

Mr. Lynn—Yes; they were "two successive consignments."

Mr. Clark—I understand that 12 inches was the size of the center seal Mr. Lynn refers to. Is it not common experience that in large size center seals it is practically impossible to have the joint between the cap and seal tight? If anybody has a center seal as large as 24 inches, and it is tight all the time, I would like to hear from him, for I do not know how he does it. This really has nothing to do with Mr. Lynn's paper, but is a question suggested by his remarks.

Mr. Lynn—This crack was not in the joint, but in the division of the center seal.

Mr. Thompson—No doubt it is difficult to keep a center seal tight where you desire to grind it tight, for the reason that excessive grinding is very likely to wear away the divisions radiating from the center of the seal. We are very careful when we grind our center seals to keep the emery and oil off from those divisions.

On motion of Mr. Dunbar, seconded by Mr. Thompson, the thanks of the Association were voted to Mr. Lynn for his paper.

The Association then adjourned to Thursday, May 16th, 1895, at 9:30 A.M.

SECOND DAY—MORNING SESSION—MAY 16.

The Association was called to order pursuant to adjournment, and the President said the proceedings would be commenced by Mr. J. A. Faux, of Pittsburgh, Pa., who read the following paper on

RECUPERATIVE FURNACES AS APPLIED TO BENCH FIRING: THEIR OPERATION AND RESULTS.

Recuperative, tending to recovery or pertaining to recovery; in bench firing, meaning the recovery of waste or lost heat, and returning it either through or above the fire to assist in maintaining the temperature in the fuel or combustion of fuel gas formed in the generator.

Recuperative furnaces are of two kinds, half-depth and full-depth. A half-depth recuperative furnace is one in which the zone of combustion is removed from the beginning of the heat absorbing surfaces by introducing sufficient air pre-heated to a certain temperature, which has a tendency to shorten the flame in the combustion chamber. A full recuperative furnace is one that is greatly enlarged in the principles applied in a half-depth, viz., both in the size of the furnace and the length and number of the recuperative flues. The zone of combustion is much shorter. The furnace has a much deeper fire bed, and the air is sent to the point of combustion heated to a very much higher temperature.

A full recuperative furnace is capable of giving better results than any other furnace used for heating retorts, both in economy of fuel and in maintaining a constant temperature. This furnace is now giving better results than have yet been obtained by any other type.

In starting a recuperative furnace the producer or furnace proper is filled with fuel and lighted. The primary air necessary to maintain incandescence in the fuel enters through the openings in the sides of the ash pit underneath the fire-bars, and is raised to a high temperature by passing it through a series of flues encircling the ash pit. The primary air and steam are mixed in the proper proportions in this flue, and are raised to the same and very high temperature. In a properly constructed recuperative furnace the steam can be superheated with no additional expense by making a series of steam pipes in the recuperative flues. The superheating of the steam is a decided advantage, for the reason that it will then enable the use of the proper amount without the disadvantage of cooling to a great extent the incandescent carbon, and will enrich the gas with its hydrogen and oxidize the coke much more rapidly, thereby reducing the quantity of nitrogen.

The decomposition of the carbon with this superheated steam and primary air produces first $H_2 + CO_2$, then $CO_2 + C = 2CO$. The place in the generator where the larger per cent. of the chemical action takes place is known as the zone of combustion, and from here the gas passes on its way to the nostril holes of the generator and is called producer gas, containing about 50 per cent. of nitrogen. With the use of superheated steam with the heated primary air the initial temperature in the generators can be kept at such a low point that the mineral matter in the fuel will be converted entirely into ash instead of clinker. Under these conditions the rate of combustion is easily controlled, and, with this low temperature in the generators, the life of the same is very much longer, and under the same condition the H_2O and CO_2 are completely converted into hydrogen and carbon monoxide at a low temperature, which results in the saving of fuel as well as reducing the labor of the fireman. At the nostrils the producer gas meets a second supply of superheated air, termed the secondary air, which has been raised to a very high temperature by recuperation. This results in the CO and H being again burned to CO_2 and H_2O, giving a very high flame temperature on account of the initial high temperature of both gases. The chamber where this intense heat is generated is called the combustion chamber, and should be sufficiently large to allow for the expansion of the burned gases. The amount of secondary air should be such that combustion will be complete, and the waste products of combustion should not show over 0.5 per cent. of a free oxygen. The combustion flame will be short and complete. At no time should this flame exceed the height of the combustion chamber; for, if it does, the unburned portion of the gas is likely to be burned in the flues and chimney, and if good recuperation is not used the heat will all be lost. In any event, the flues and chimney are not the places in which to burn the gases.

In full-depth recuperative furnaces of proper construction the gasifying of the fuel (in connection with other economical features) and the saving of fuel are much greater than by any other common process of production of heat. By converting the fuel into a gas and using without loss by cooling (as in gas making) we are able to use for heating the retorts an inferior coal, or coke breeze, or both, neither of which could be used in an ordinary fire. In a practically perfect recuperative system we are enabled to obtain a very high heat, and a large quantity of the same, on very economical principles.

Results in retort firing as at present obtained show that in many furnaces much more than one-half of the fuel used is wasted. In our best furnaces at present in general use the amount of fuel used is far in excess of the amount required. In a full-depth recuperative furnace the waste heat can all be returned to the oven, allowing only sufficient to escape with the products of combustion to cause sufficient draught for the proper working of the furnace and keep all water produced by combustion in the form of steam. In the use of bituminous coal for retort firing, immediately after a fresh supply of fuel is laid in the fire, very large amounts of highly valuable heat giving hydrocarbons are produced. The distillation of these is a heat absorbing process, and if their combustion is perfectly accomplished it will add greatly to the efficiency of the producer, as well as to the value of the heating power of the producer gas.

The coal is distilled off faster than the coke is oxidized, consequently the quality of the gas will vary; under these conditions the perfect control of the proper quantity of air to make the proper length of flame is almost impossible. The dampers and draught should be adjusted to the flame length at the average amount of gas made. With this point

carefully studied, and the production of gas and the supply of air for the combustion of the same properly adjusted, the best practical results will be obtained. For a short time, when fresh fuel is charged in the generator, a small jet of superheated steam is turned into the secondary air flues, the amount of secondary air is increased, which, with the steam, completely consumes all excess gas burned from the fresh fuel and allows no smoke to pass into the stack. Bituminous coal has a heat value of 1.038; retort coke, 0.866, a difference in favor of the coal of 16.2 per cent. Carbon = 1. A pound of coal will develop about 1,400 more heat units than a pound of coke, for the reason that the coal contains a considerable amount of combined hydrogen, which has a very high thermal value. From this it will be inferred that from bituminous coal firing we are to expect by far the best results, if we are able to properly construct a furnace and setting that will give us the full value of the fuel. From the following we are able to infer what, in the near future, will be the results in practice with a full-depth recuperative furnace in the heating of retorts for gas making. With a low grade of coke made from unwashed slack coal, with ash at about 10 per cent., 11 pounds of same in the generators will carbonize 100 pounds of same quality of slack coal. One pound of carbon from gas coke with good combustion will yield 12,632 heat units. Then one pound of slack-coal coke with about 10 per cent. of ash will yield only 11,368 heat units, and 11 pounds will give 11 × 11,368, or 125,048 heat units.

For the carbonization of good quality of gas coal only 70 per cent. of the above amount of heat is needed, or 87,533 heat units per 100 pounds in the retorts.

A good furnace or generator of the modern full-depth recuperative type can produce from a ton (2,000 pounds) of unwashed slack coal about 140,000 cubic feet of producer gas, containing about 40 per cent. of combustible material, having a heat value of 151 heat units per cubic foot, or a total of 21,000,000 heat units. If it requires 87,533 heat units to carbonize 100 pounds of gas coal, then 21,000,000 heat units will carbonize 24,000 pounds, or 8.3 pounds in the generator to each 100 pounds in the retorts.

In the use in the generators of a good quality of coal, in which the per cent. of ash is low, corresponding results will be obtained. These facts are startling when we consider the amount of fuel we are wasting in the many kinds of furnaces in use for retort heating—in most instances as much and more than 25 pounds of fuel for every 100 pounds of coal carbonized.

In a large recuperative furnace, producing practically perfect combustion, results as referred to above can without doubt be obtained. The heat can all be recovered except the small amount needed to keep the products of combustion above steam temperature.

The following are results that have been obtained in ordinary practice with a full-depth recuperative furnace with a bench of 6's and small arch:

For the month of March.

Amount of unwashed slack carb.....	1,072,800 pounds:
Amount coke from unwashed slack, used for fuel in generators.....	112,980 pounds.

Or an average of 10.53 in generator to 100 pounds slack carbonized, or an average yield of 3.85 cubic feet per pound.

Used an average of .7 gallons of 65° naphtha per 1,000 cubic feet of mixed gas; total candle value, 19. Allowing 6 candles per gallon, we have 4.2 candles from the naphtha; 19 — 4.2 = 14.8 candles, or 56.98 candle-feet per 100 pounds slack.

By increasing the fuel in the generator 2 pounds per 100 pounds in the retorts, we are able to increase the yield to 4 cubic feet per pound, or an increase of .15 cubic feet per pound. To this yield we must add .9 gallons 65° naphtha = 5.4 candles; 19 candle — 5.4 candle = 13.6 candles per foot, or 54.4 candle-feet per pound.

The above shows that any yield of gas over 3.85 is produced at a loss both of fuel and naphtha. The per cent. (about 18) of combustible in the ash of these furnaces is quite high, which is accounted for in the faulty construction of the first generators. Should the combustible be reduced to about 7 per cent., the difference will materially decrease the present average per 100 pounds in the generator.

It is with reluctance that we accept this as the ultimate result. The plainer and more infallibly certain we are that the result will be attained the more doubtful we seem to be of its occurrence. We must certainly admit that this is a stepping stone, and in practice it will be firmly supported. It is as yet a novelty. It may be possible that some will dare for a time to set their feet upon it, but ultimately they will be found in the tide of general practice. This is an age of improvement, and we as managers are liable to our superiors for our results. Let us be, therefore, alive and awake to their interest, and not stand by and see at least one-half of our fuel going up the chimneys without making any effort to prevent the same. It is now time that we assist in this concentrated tide of improvement, no matter how undesirable the landing may be.

Discussion.

The President—Mr. Faux will be pleased to answer any questions.

Mr. Forstall—Mr. Faux says that for the carbonization of a good quality of gas coal 87,533 heat units per 100 pounds are needed. I would like to know where he got that figure. I always thought that, while theoretically it was very hard to ascertain how much heat it takes to carbonize a pound of coal, practically it was still harder.

Mr. Faux—I think the explanation is given in that part of the paper which states that 11 pounds of coke from unwashed slack will carbonize 100 pounds of the same quality of slack coal. It is worked down from that.

Mr. Forstall—I understood from the statement that that was the amount of heat actually needed to distill the coal, without taking any account of the loss; but if that is the total amount of the heat, then I understand it.

The Secretary—At what temperatures do your waste gases leave the bench?

Mr. Faux—I cannot tell you. I have never tested the temperature, because the stacks are always black or dark. At one time we thought about making the test, but discovered that in order to do it we would have to dig underneath to get at our lowest flue, because, while between the furnace and the stack is only 9 inches, there is no question but that underneath there is a good deal of radiation. It would not be a fair test to take the temperature at the top of the stacks.

Mr. Highlands—I think we have listened to a very able paper, and one that will no doubt lead to good practical results. I move the thanks of the Association be extended to Mr. Faux for his very able paper. (Seconded by Mr. Nash, and adopted.)

Mr. George Osius, of Detroit, Mich., then read his paper, entitled:

AMMONIACAL LIQUOR; WITH A SPECIAL REFERENCE TO THE UNIVERSAL SAVING OF THE SAME BY GAS COMPANIES.

Mr. President and Gentlemen—The subject, "Ammonia," has become a familiar factor with gas works, large as well as small ones, more during recent years than at the time of primitively constructed gas works producing a poor but high priced light.

No gas works in these days of progress can afford to stand in the field of competition without the most economical, as well as the most efficient, equipment for the production of the "light of the people" in its various stages. It is no longer a question how small a plant will you need to make the gas, or how cheaply you can erect your plant, but where can you get the most perfect apparatus to make the best gas at the lowest cost?

You are well aware that the success of a business depends upon its economic conduct; for matters which may at first appear to us to be insignificant will, in the course of time, grow to importance and become items worthy of attention.

No longer than 10 or 15 years ago, bye-products of gas works were waste products, being unavoidable burdens to the gas company and to the inhabitants of cities blessed with a gas works. Year after year conditions have compelled the producer of gas to study its cost most carefully, and, in order to reduce it, to adopt more efficient apparatus and to employ its products to the best possible advantage. All this has had a tendency toward investigation of opportunities for the creation of new revenues or of finding a more profitable market for these products. It is for this reason, and also because of the repeated suggestions of interested parties, that the ammonia, or as it is better known to you, the ammoniacal liquor, has of late received more attention than heretofore. But still, comparatively few works are awake to the fact that thousands of dollars are wasted annually through their inattention to the ammoniacal liquor incidentally produced within their doors.

Continuous agitation and presentation of facts and figures have done much to arouse an interest in this product, especially for the purpose of adding additional revenues to the annual income. While a great many gas works—some of them with but a small output—have adopted during the last five years a process of concentrating their crude ammoniacal liquor, many allow themselves to remain behind the line of progress. Of nearly 1,000 American gas works, only about 150 utilize their gas liquor in some form or another. Some works do not produce any ammonia, but there are hundreds with an aggregate consumption of over four hundred thousand tons of coal per annum that are wasting their

ammoniacal liquor resultant from that carbonization. Assuming, as a conservative estimate, that their ammoniacal liquor will not exceed 18 pounds of 20 per cent. NH_3 in the liquor per ton of coal carbonized, we arrive at the surprising amount of 7,200,000 pounds of 20 per cent. NH_3 liquor which is annually lost to this country, and more especially to the gas works.

Ammoniacal liquor is now a staple product on the market, and it must be obtained to supply the wants of the various branches of industry dependent upon the product. In nearly all instances where ammoniacal liquor is used, sulphate of ammonia can be substituted should a shortage of the liquor be caused through an unusual demand, and for that reason the large manufacturing establishments of the country have not been embarrassed as yet concerning whence to draw their supplies.

Are the American gas works the sources of such supplies, and does our own capital produce this source of income to its principal? Oh, no! We prefer to waste millions of pounds annually which could, with little care and expenditure, largely decrease our dependence upon our foreign neighbors; but instead of utilizing whatever quantity of liquor our American gas works produce, we go to foreign markets and bring over thousands of tons of ammonia in various forms, while millions of pounds are wasted at our doors.

Two questions will naturally be asked: First, how will it pay us to utilize the crude ammoniacal liquor? Secondly, if all gas works would save and sell the liquor would this not have a tendency to create an over-production and therefore reduce its value below a reasonable basis of profit?

In replying I will more especially refer to gas works carbonizing from 750 to 3,500 tons of coal per annum, as most companies with a larger consumption have seen the advantage before this of giving the ammoniacal liquor proper attention.

In computing the pecuniary advantage of this investment, expectations should be built upon a basis which would apply to ordinary investments and upon which a corporation would be prepared to enlarge its works—in other words, to expect a fair and reasonable return from a permanent expenditure connected with the undertaking. An investment in the commercial world, yielding its principal 15 per cent. per annum and more, I may say is considered a desirable opportunity. Why, then, should the utilization of ammoniacal liquor be considered differently? Is it not worth while to reduce the general cost of gas a few cents per 1,000 feet without even entailing expenses other than the first investment? The years have gone by when the profits of gas companies would soon equal the cost of the fundamental investment; and it is today the small savings at this and that end of the works which help swell the amount to be earned for a dividend. Wherever the ammoniacal liquor is saved, as a matter of consequence other savings are made which increase directly and indirectly the benefits from the investment. In giving proper attention to the saving of all the liquor produced, the liquor must be subjected to a thorough settling, and it is thus relieved of a considerable quantity of tar which would be carried away with it into the sewer, providing the liquor were not saved. This saving, small as it may appear, increases the accumulation of tar by at least 10 per cent., and, estimating this at $1.50 per barrel, is this not worth saving? This result should be added to the profits stated before.

Again, you derive indirect benefits. The method of saving the crude liquor compels you to use the weak liquor for the washing of the gas, and you are therefore in a position to extract almost all ammonia at the scrubber, instead of allowing the purifiers to take care of it. Your purifying material will be allowed to serve longer, less time is required to change the foul boxes, and your expense account as well as your gas receives the benefits.

To attain all these results you will not be called upon to increase your pay roll or incur other expenditures, save that of the cost of the concentrating plant; and, as the latter can be obtained on most convenient terms as regards the method of payment, there is no reason why your attention to the question should be put aside—because of a possible doubt that the undertaking will not pay. Give the washing of the gas reasonable attention, let a scrubber of sufficient capacity (not the boxes) eliminate the ammonia from the gas; save the liquor from all sources; prevent the escape of ammonia gas from defective storage tanks—and you cannot fail of success; and, at the end of the year, the pecuniary results will be most gratifying. If these suggestions are carried out, it will prove to you that, even on a small carbonization, your efforts will be not only well rewarded, but that the money invested has earned you without doubt from 15 to 75 per cent.

The second question, not less important than the first, can be answered by an explanation of general conditions in this country pertaining to ammonia.

The steadily advancing improvement of refrigerating machines has caused an almost universal use for them on land and sea, thereby constantly increasing the demand for ammonia, the only refrigerating agent used to any extent. Thousands of farms depend, from year to year, upon sulphate of ammonia as an artificial fertilizer. A number of old and new branches of American industries depend upon ammonia as an important raw material in one form or another. Neither of these channels will ever cease to be an outlet, and more ammonia than now produced will be required in the future. The adoption of the water gas process by a large number of our gas works as an auxiliary to their plant, and the abandoning of the coal process entirely at some places, have, during the last 5 or 10 years, decreased the domestic resources of ammonia. During the last two years, over 26 million pounds of ammonia in various forms were imported by the United States. While this may seem an unusually heavy importation, there is no doubt that Europe will always supply us with a portion of our requirements. As you all know, efforts are being made, with all prospects of an early success, to introduce the various systems of coke ovens in America for the purpose of utilizing the by-products, and especially the ammonia resultant from the process. While we may expect with certainty large quantities of ammonia in the liquor as well as in the salt from this new source, you can safely assume that any increase in our home production will either be taken care of by a larger demand or will decrease the importation. However, as the increasing demand for refined ammonia will steadily keep pace with the production of the raw material, I see no danger of an over production in this country, notwithstanding a reasonable importation of the article from foreign countries.

I therefore recommend to you the saving of your ammoniacal liquor, which is not only a source of remunerative and additional income, but is also in line with the principle of economy.

Discussion.

The President—I think this is a very interesting paper, and Mr. Osius will be only too pleased to answer any questions.

Mr. Osius—I may state here that, in addition to the data given in this paper, I have some which, owing to an accident, I was not able to put my hand on at the time of writing. The production of sulphate of ammonia in the United States is 30 million pounds; that is, our entire product is 30 million pounds, irrespective of the ammoniacal liquor; and as this is about all used in this country for fertilizing purposes only, we have a large amount to supply for mercantile, mechanical and other purposes, whatever they may be. So you see that it is almost impossible to cause an over production in this country, or a production beyond what is needed for domestic uses.

Mr. Howard—With the minimum amount of coal carbonized, would it pay to put in a plant for saving the ammoniacal liquor?

Mr. Osius—I believe it would. Although the return may in some cases seem very small, comparing with the amount of money which it is necessary to invest, still I think it would pay to erect a plant for even the minimum amount of coal carbonized, as stated in my paper. If you get 18 pounds of 20 per cent. liquor per ton of coal carbonized (which is the lowest estimate I have accepted in my paper), your investment will certainly pay from 15 per cent. up, counting as well the interest which you would necessarily have to figure on your investment of capital. Of course it would depend somewhat upon the price you would be able to obtain for your product. But, as I stated before, no one with a small carbonization, taking up this question and looking into the matter, should expect a gold mine. It will return a fair percentage on the investment, such as you would be willing to make every day—a fair and safe investment. Of course, the larger the carbonization the better would prove the investment. A small carbonization, say of 750 tons of coal per annum, would realize, say from 15 per cent. upward.

Mr. Highlands—This is one of the papers that we can take home, and from it study and figure out for ourselves the results and benefits to be gained from it. I do not think there are any here who are operating a coal gas plant who will not be able to derive satisfactory pecuniary benefits from the investment which Mr. Osius has suggested. I therefore move a vote of thanks to Mr. Osius for his very interesting paper. (Seconded by Mr. Howard, and adopted.)

In the absence of Mr. C. B. Case, of Milwaukee, Wis., the President asked Mr. E. G. Cowdery to read the paper by the former on

THE BEST METHOD OF INTRODUCING GAS ENGINES.

While called upon to tell you the best method of introducing gas engines, I prefer to tell you what we have done in Milwaukee to this end, and with what result, and leave you to decide whether or not ours is the best method.

In November, 1893, the Milwaukee Gas Light Company decided that 47 gas engines were not a sufficient number for the thirteenth city in population in the United States, and employed the writer to take hold of the matter of increasing the number of users of gas engines in that city.

My time was originally divided between the gas engine industry and the sale of tar and coke; but in June, 1894, the gas engine end of the business warranting the change and proving more congenial to me, a division of labor was effected whereby the gas engines solely came under my charge.

To start with, I didn't know a gas engine from a threshing machine. I was possessed of some newspaper experience, and had for 12 years been a traveling salesman in lines quite foreign to this. Investigation, however, made me an enthusiast on gas engine economies. I made it my first work as a representative of the Gas Company to visit personally every user of a gas engine, and ask information as to the satisfaction each engine was giving, make and horse power of each, class of work being done, average hours and load, and such other matters as circumstances might suggest. This was tabulated, and, with the gas bills for every engine in use in 1893, was printed in book form under the title of "Gas for Power," and distributed freely to all power users in the city in the early spring of 1894.

Meanwhile the Gas Company secured the local agency for such gas engines as were generally considered the best, where they had no other local agent, and gave their selling into my hands. We sold the engines as nearly as possible at their regular selling price, the commission received readily offsetting the attendant expense and salary of the department.

Several sales resulted directly after our book was circulated, and inquiries for facts and prices came throughout the summer. In September our Industrial Exposition opened for a month, and we had consigned to us without sale a 12-horse power engine, which we attached to a dynamo and gave an electric exhibit furnished by gas engine power. This was an eye-opener to many, and we gave away personally 10,000 copies of a "Gas Engine Primer," got up as a souvenir for this occasion. Commencing in September, we also continued our educational campaign through the newspapers, by means of write-ups and display advertisements, the artist invariably using some fresh cut to attract attention to what we had to say in print—a few words to the point. The classified or want columns of our daily press we also used to advantage continuously for several months, changing copy each week, which kept our reminders always in print. This was accompanied, of course, by personal solicitation among steam and electric power users, and the largest users of electric light. The result of this educational campaign has been satisfactory in many ways. We have not only increased the number of users of gas engines 30 per cent. the first year, but we have put ourselves where we are recognized as a factor when power is thought of. I can now get an audience with anyone, while formerly the words "gas engine" were received as something of a joke, and dismissed with the conviction of pre-eminence in the assurance that "we use steam power," which was supposed to settle us.

While personal solicitation is essential to success in this as in any other pursuit, there is also something more that is especially needed in the gas engine business, and that is the establishing of a moral tone, with the public, favorable to gas engine power. The gas engine is right, and does not need to be defended; but the public will not find it out unless they are told. Every way in which gas engine figures and facts can be put into the minds of the public, whether through their eyes or their ears, is a gain on the side of gas for power. The indirect results are not to be despised, and the establishing of a popular feeling generally is very essential. We have learned in Milwaukee also to aim for the big game, the users of 50-horse, 100-horse, and larger horse power, not despising the smaller ones, but trusting them to follow the lead of the larger, rather than to the larger following the smaller. The old idea that gas engines are only suitable where very small power is needed is now easily combated and overthrown.

In January of the present year we again printed the past year's gas bills, adding the new names and some new facts, and distributed them, together with a blank to be filled out by steam engine users as to the cost of operating their plant, and asking for comparison with the same sized plant operated by gas engine power. The sale of three engines in two days followed this, and other sales later, among them a 50-horse power; about two inquiries a day for prices and facts have succeeded, and the outlook for spring business is most promising.

We obtained 20 new users of gas engines during 1894, aggregating 148 horse power, and lost 6 for reasons nowise to the discredit of gas engine power. Where we had 47 engines in use in the city in January, 1894, we have 61 on January 1, 1895—a 30 per cent. increase.

I recognize the fact that circumstances are not the same with all of you as with us in Milwaukee. Before taking hold of this business myself there were but two or three dormant agencies in our city, where, if a man was determined to buy a gas engine, he could be accommodated; but there was no one to tell the story in all its truth. In many of your cities the best engine factories are doubtless already represented. If not, your course is clear. Secure the agency of one or more of the best engines, either as an adjunct of the State agent, or direct from the factory, and turn a good man loose on the community to tell the truth. Get a man rather than a boy, and one who, seeing merit, can tell what he sees and believes. Adopt a liberal policy; expect to spend a few dollars in printer's ink, and pay your man a living salary rather than a commission on the sales that may be (doubtless will be) remote. He may possibly go some months without effecting a sale, but if he is the right man he is educating both himself and the public while making the effort, and the desired results must follow as a consequence.

If, on the other hand, your city is properly represented by the best gas engine factories, get close to each agent by inviting him to your office and talking the situation over. Without prying into their business, get at the situation from the standpoint of each, and many ways of holding up their hands to your advantage will appear to you. If it seems warrantable, let one of your best office men devote part of his time to the gas engine business in the way of assisting the resident agents in telling the truth to unbelievers. Without singling out any certain engine, you can still use printer's ink to put the benefits of gas engines in general before the reading public. Print the amount of the gas bills for the different engines, and put it into every man's hand.

We in no manner allow ourselves to antagonize any good make of gas engine offered in our city, although we have our preferences, and our reasons for them are justified by economy in gas bills and freedom from repairs, etc. We don't sell all the gas engines sold in Milwaukee, but we still take the credit of creating the demand largely. We do not sell our engines at cost, nor do we think it would be appreciated by the purchaser if we did, and certainly not by the factories. We do pay freight and cartage usually, making our price net delivered on their foundations. We have also inaugurated a time payment and lease system of sale which is captivating to firms of moderate means, and sometimes to the larger ones. The risk is reduced largely by the leasing plan, as the property remains ours until paid for. We require a moderate first payment, and the balance monthly to suit, small interest being added.

There is one thing still in line for each Gas Association, and each individual gas company to do, and that is to hammer at the gas engine makers to reduce their selling price. A steam engine of the highest grade does not cost over 10 cents per pound to-day, and there is no satisfactory reason to be given why a gas engine should cost two or three times as much per pound. It is true that gas engine factories are working overtime and are behind on orders, and such a condition is not favorable to reducing prices. But the fact remains that a 25 per cent. cut on the present list price would double the sales and leave a good profit to the makers as well. The gas engine business is destined to grow to as great proportions in this country as in foreign countries, and the best makers should be the first to advance to the plan of fair prices, enlarging their plants and their output to hasten that day, and not stand in their own light by adopting the policy of getting all they can for the engines they do make, at the expense of their own pocket and yours. Gas engines will in a few years sell themselves if the makers will supplement the efforts of the awakened gas promoters by an approach to civilized prices.

Meanwhile you can tell the truth about gas engines, and use the printer to help you, and a public hungering for economies will get in line at at your application window asking for meter and service to gas engines.

Discussion.

The President—I know Mr. Cowdery is able and hope he is willing to answer any questions on the subject of this paper.

The Secretary—What is the power of the smallest size of gas engine now in use in Milwaukee?

Mr. Cowdery—Four-horse power.

Mr. Peter Young—Can Mr. Cowdery tell us in what places and for what purposes these gas engines were generally placed and used?

Mr. Cowdery—For printing offices, for elevator work, for small machine shops, and some in carpenter shops. I think that covers the ground. I cannot think of all the different uses readily. I think that several are used in electric light work.

The Secretary—When a 10-horse power Otto engine is put on the second or third floor of a building what means do you adopt to prevent its shaking the building or floor?

Mr. Cowdery—I do not know that we adopt any means. We have had no great trouble from that source. In one or two cases that I know of a battery of four engines was put as high as the fourth floor of a building, and while standing on that floor a decided vibration of the floor was noticeable. On the floor below it the vibration could be felt a little, but otherwise it did not seem to trouble the occupants of the building at all.

Mr. Jenkins—Last season we put a 16-horse power gas engine on the third floor in the corner of a building. We ran iron stanchions from the basement to that floor, and then arched over with iron and brick, thus making a solid foundation for the engine to rest on. There is a slight vibration on the top floor—you would not notice it when standing on the roof, and it was not sufficient to interfere at all with the building.

Mr. J. W. Stratton—Did your gas engines displace any electric motors?

Mr. Cowdery—Yes; quite a large number, especially the engines put up last year. Several parties who formerly used gas engines, and had thrown them out and put in electric motors, came back again to gas engines on account of the high cost of electric power. The general impression gained by us from a number of people we talked with was that the electric power cost about three times that of gas power.

Mr. Thompson—I am sure we have all listened to a very instructive paper, which will be of very great value to us in pushing our local gas engine business. I move a very hearty vote of thanks to Mr. Case for his very valuable paper, and to Mr. Cowdery for the information he has given us in connection therewith. (Carried.)

Some Further Discussion of the Paper by Mr. Osius.

The President—I have been informed that there are members present who would like to ask Mr. Osius some further questions regarding his paper on "Ammoniacal Liquor." Are there any questions that any one desires to ask Mr. Osius?

Mr. Somerville—I think the debate on this most important paper by Mr. Osius was cut off rather short. In view of the fact that the manufacture of gas from coal is likely to increase rather than diminish, I think the discussion of this paper ought not to have been shut down in the way it was done. I do not know that I have anything to add to that discussion; but I know there are a number of people here who are concentrating their liquor, and I would like to hear from them if they are willing to corroborate Mr. Osius' statements. A word from those who are using up their liquor will, I am sure, go a greater way to convince those who are thinking of trying it, than the statement that Mr. Osius himself makes. I believe Mr. Forbes is trying to do just what Mr. Osius recommends, and so would like to hear something from him, to the end that we can understand whether the experience of each is measurably alike. It is to me a most marvelous thing to think of the amount of valuable ammoniacal liquor that runs to waste. At Indianapolis we get 40 cents per ton of coal carbonized for our ammonia. If some of the other companies get half of that amount, then there is that much saved. I can corroborate his remark about extracting the tar at the scrubber rather than allowing the purifiers to take care of it. A saving is made in that way; and not only that, but bringing the gas in contact with the liquor itself saves at least 25 per cent. Taking it altogether, I think we ought to make more from our ammoniacal liquor than some of us do at present.

The President—Do you estimate your ton of coal at 2,000, or 2,240 pounds?

Mr. Somerville—Our ton of coal is of the weight of 2,000 pounds.

Mr. Forbes—I do not know that I have much to say except to corroborate what Mr. Osius has read. We have been working off the liquor for perhaps two months, but the result has been very satisfactory thus far, and more especially in respect to the gas. The effect on the gas has been of importance and value to us since we have been working with the weak liquor; and the returns from the concentrated liquor have been more than satisfactory. Mr. Peter Young would know more about that, for he has been longer at it than I have.

The President—We would like to hear Mr. Young's experience in concentrating ammoniacal liquor.

Mr. Peter Young—We have been concentrating our liquor for only a very short time, and have made but one shipment of it, but so far we have found it very satisfactory. That first shipment returned us about 3 cents per 1,000 feet of gas made. The process is working nicely now, although we had some trouble at first. Our coal in the South seems to be a little different from the Youghiogheny coal in that ours carries a little more sulphur. As we had no acid testing apparatus, we had to depend upon the hydrometer, and there being such a large percentage of sulphur in the coal, the specific gravity of the liquor was so increased that we were very much disappointed when we came to make the acid test. After finding that out we got along very well, and the result has been very satisfactory.

Mr. Osius—May I be allowed to say another word in reference to this question? It has frequently come to my notice that the ammoniacal liquor had been satisfactorily concentrated by this or by that process—that a strong liquor has been produced and a satisfactory result obtained per ton of coal carbonized—still, when the liquor was shipped it proved to be considerable less than estimated, sometimes one-half and sometimes only a third. I take the opportunity in this connection to specially call attention to the practice of storage. It is the most important detail, I think, in this whole matter. I have known of instances where a satisfactory amount of ammonia was produced in concentration, but the storage tank lost it afterwards. Ammonia is extremely volatile, and particular care must be taken to keep the concentrated product in a perfectly tight place, for thus only can you get satisfactory returns and have satisfactory results.

Mr. Clark—I was so unfortunate as not to hear the discussion on Mr. Osius' paper, and I would like to ask if there has been any recent experience in connection with the liming of coal for increasing the ammonia. A number of years ago I made several experiments in that line, and while I am still thoroughly satisfied (having a full share of self-confidence, perhaps) as to what the results will be of coal liming, and as to its value, I have not yet been able to get anybody in America to express the same opinion. Possibly in the last two years some one has had some experience which may be valuable to me in this connection.

Mr. Evans—I do not think Mr. Osius makes it clear when he states that the returns as to the revenue to be derived from putting in a plant for saving the ammoniacal liquor will be from 15 to 75 per cent. on the capital invested. This is a very wide variation. Mr. Knight, of Kalamazoo, Mich., tells me that a plant was put in for him at an expense of $1,500, and that the revenue therefrom is $19 per month. That figures about 15 per cent. I wish to ask if that is about the average return on the investment.

Mr. Osius—The percentage to be taken into consideration is based, first, upon the carbonization, and, second, upon the price for the product. A party at a distance from the market cannot expect the same return as another party close to it; and there are other circumstances and conditions which will influence the pecuniary results. I will, however, hold to what I said before—that on a carbonization of 750 tons the returns may safely be estimated at 15 per cent. under any circumstances, provided the party is careful and observant enough in saving all his liquor, and after he has once saved and concentrated it will save it again in the storage tank. In most cases the weak point is this. It is just the same as in respect to buying coal. Two engineers will buy a certain weight of coal that is of the same quality, and yet your results will be less satisfactory than that of your neighbor or his less than yours, and still you use the same coal. You may be more careful or less careful than your neighbor, or one may have better local conditions than the other. Such varying conditions will control in just exactly the same proportion the results derived from utilizing the ammoniacal liquor. I hardly think that the results obtained at the Kalamazoo plant should be taken as a fair basis for an estimate. If Mr. Knight is present I would be very glad to meet him and discuss the matter.

Mr. Peter Young—Mr. Osius urges the necessity of having tight storage tanks. I would like to know how it is that, when in shipping the ammonia—we are compelled to ship in a Union Tank Line car, with its several openings and with pipes not very tight—we find in calculation that it is one ounce short?

Mr. Osius—A discrepancy of only 1 ounce on a strength of 40, 60 or 65, is very small indeed, especially when you consider the distance the shipment has to travel before reaching its destination. You may very easily lose that much in pumping to the car, or before you have succeeded in sealing the car or screwing up the lid. So I believe 1 ounce is about the smallest loss you should consider. In the majority of cases you will be fortunate if it is not more than that. Of course, a tank car should be as tight as the storage tank, since it is at all times exposed to the influence of sun and weather.

Mr. Thwing—I would like to ask Mr. Osius this question: 1 ton of 100 per cent. liquor would equal how many ounces of sulphuric acid, or compounds of ammonia?

Mr. Osius—Do you mean to ask how much 1 ton of 100 per cent.

liquor would require of acid to neutralize it? That would be 1 ton of 400-ounce liquor, if I understand your question rightly. Of course it is an impossibility, under any conditions, to have a 100 per cent. liquor.

Mr. Thwing—Containing 20 per cent. of ammonia in concentrated liquor.

Mr. Osius—One ton of 20 per cent. liquor is equal to one ton of 80-ounce liquor. Of course you are familiar with the manner of testing, and understand what this expression implies.

The Secretary then called the roll, the following members responding:

ROLL CALL.

Honorary Members.

Slater, A. B., Providence, R. I.	Leach, H. B., Taunton, Mass.
White, W. H., New York City.	Barker, F. E., Boston, Mass.

Active Members.

Baxter, I. C., Detroit, Mich.	Lansden, T. G., St. Louis, Mo.
Bivings, W. L., Birmingham, Ala.	Littleton, A. W., Quincy, Ills.
Blodget, C. W., Brooklyn, N.Y.	Lynn, J. T., Detroit, Mich.
Butterworth, Irvin, Columbus, O.	McDonald, W., Albany, N. Y.
Byron, T., Birmingham, Ala.	Miller, A. S., L. I. City, N. Y.
Chollar, B. E., St. Louis, Mo.	Miller, C. R., Pittsburgh, Pa.
Christie, W. H., Corning, N. Y.	Miller, T. D., Dallas, Tex.
Clark, W., Philadelphia, Pa.	Morrell, E. E., Cicero, Ills.
Collins, C., Green Bay, Wis.	Montgomery, J., Sedalia, Mo.
Corscot, J., Madison, Wis.	Morgans, W. H., Pontiac, Mich.
Cowdery, E. G., Milwaukee, Wis.	Moses, F. D., Chicago, Ills.
Cowdery, R. E., Topeka, Kas.	Murdock, J. W., Ottawa, Ills.
Cressler, A. D., Fort Wayne, Ind.	Nash, A. F., Windsor, Ont.
Darrah, S. M., Wheeling, W. Va.	Odiorne, W. H., Springfield, Ills.
Dunbar, J. W., New Albany, Ind.	Penn, J., Washington C. H., O.
Dixon, J. A., N. Y. City.	Perkins, B. W., South Bend, Ind.
Eaton, W. M., Jackson, Mich.	Ramsdell, G. G., Phila., Pa.
Elbert, V. L., Menominee, Mich.	Ridgely, E., Springfield, Ills.
Evans, C. H., Chicago, Ills.	Sellers, W. B., Covington, Ky.
Faux, J. A., Pittsburgh, Pa.	Shelton, F. H., Phila., Pa.
Ferrier, J., Columbus, Ga.	Slater, A. B., Jr., Providence, R.I.
Forbes, J., Chattanooga, Tenn.	Somerville, J., Indianapolis, Ind.
Forstall, A. E., Newark, N. J.	Steinwedell, W., Quincy, Ills.
Greenough, M. S., Cleveland, O.	Stratton, J. W., Valparaiso, Ind.
Gwynn, J., Steubenville, O.	Tayler, G. H., Warren, O.
Harper, G. H., Altoona, Pa.	Thompson, G. T., St. Louis, Mo.
Highlands, S. M., Clinton, Iowa.	Thwing, O. O., Milwaukee, Wis.
Howard, J. B., Galena, Ills.	Tracy, W., Leavenworth, Kas.
Humphreys, A. C., N. Y. City.	Warmington, D. R., Cleveland, O.
Hyde, E. A., Ravenna, O.	Woods, G. E., New York City.
Jenkins, E. H., Columbus, Ga.	Young, J., Allegheny City, Pa.
Knight, C. S., Fort Wayne, Ind.	Young, P., Knoxville, Tenn.
Knight, J. J., Kalamazoo, Mich.	Young, R., Allegheny, Pa.

Associate Members.

Bissell, W. G., Chicago, Ills.	McIlhenny, J., Philadelphia, Pa.
Bredel, F., Milwaukee, Wis.	Osius, G., Detroit, Mich.
Brown, E. C., New York City.	Page, A. L., New York City.
Callender, E. P., New York City.	Payne, F. H., Erie, Pa.
Dell, J., St. Louis, Mo.	Persons, F. R., New York City.
Dickey, C. H., Baltimore, Md.	Roots, D. T., Connersville, Ind.
Goodwin, W. W., Philadelphia, Pa.	Roper, G. D., Rockford, Ills.
Guldlin, O. N., Fort Wayne, Ind.	Russell, D. R., St. Louis, Mo.
Harper, H. D., Chicago, Ills.	Stacey, J. E., Cincinnati, O.
Harris, J. A., Philadelphia, Pa.	Stout, J., Chicago, Ills.
Hauk, C. D., Philadelphia, Pa.	Stratton, S. S., Erie, Pa.
Hayward, S. F., New York City.	Taber, R. B., Boston, Mass.
Helme, W. E., Philadelphia, Pa.	Van Wie, E. G., Detroit, Mich.
Hinman, C. W., Boston, Mass.	Wickham, L., St. Louis, Mo.
Higgins, C. M., New York City.	Young, A. W., Pittsburgh, Pa.

[To be Continued.]

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, May 10, 1895.

The Hand of Death.—Cheap Oil.—Incandescent Mantles in the Law Courts.

The hand of death, never long absent, has been unusually busy in our ranks during the last few months. At the usual half-yearly meeting of our local Association—the Southwest of England District Association of Gas Managers—which was held last week at Winchester, we had to record our regret at the decease of two prominent members, Mr. Garnett, of Ryde, and Mr. Giles, of Bridport. The list of deceased members submitted at the next meeting of the Gas Institute will be unusually long. And I have just returned from attending the funeral of a dear old personal friend, Mr. Thos. Hardick, who has passed peacefully away at an age (within a very few weeks) of 90 years, after more than half a century spent in active operations in connection with gas undertakings. He witnessed the early troubles that beset the gas supply of London, and was intimate with most of the prominent gas men of that day.

About the year 1847 he was supplying, or endeavoring to supply, a small country town by the means of a water gas process, in which steam was admitted into the back end of an ordinary horizontal retort, containing coke, and oil was used for enrichment. Not the least amusing of his numerous recollections were his anecdotes respecting this process. He could always fill his holders, but was not sure whether he got gas or steam into them, and sometimes a holder, supposed to be well charged for the evening requirements, would be found entirely empty in the course of an hour. He was an ardent supporter of Gas Managers' Associations, and was not satisfied, as some unfortunately are, with forming a unit in the list of subscribers, but went heart and soul into the spirit of the thing. He read papers and joined in the discussions, and always had something to say when he spoke. His genial and sympathetic disposition secured him a wide circle of friends, and I have seen a large number of letters of regret which convince me, in a most forcible way, that a Gas Managers' Association meeting may be utilized for purposes of even a higher and nobler grade than the ostensible object—deserving as it is—for which they are promoted. Mr. Hardick subscribed for the first number of the *Journal of Gas Lighting*, which was issued in 1849, and continued to do so to the present date. He was always an advocate of a policy that now finds general acceptance, viz., cheap and good gas, liberality in the matter of hiring out appliances, or any other means of securing the goodwill of the consumer. But when he commenced to put these views into practice, he found very little support indeed.

The gas consumer who is also a user of petroleum, and accustomed to dilate upon the cheapness of the latter, has experienced a rude shock. He has had a free course for some time, and has been able to talk about Russian competition, tank steamers, long pipe lines, and so forth, to his heart's content, for the comfort and edification of the collector whose duty it is to wheedle the payment of a gas account from him. But during the last few weeks there has been a "boom" in petroleum, which in other words means that somebody or other is trying to make a purse at the expense of the consumer. Petroleum has gone up in price, but has almost as quickly come down again. Sellers of gas, of course, are by no means adverse to exploits upon the limited pocket of the average user of the oil lamp, but those who are concerned with naphtha enriching or "producer" processes naturally regard the matter from more than one point of view. The recent experience, however, shows no reason for alarm. Indeed, rather the contrary, for it seems to show that the possibility of "cornering" the supply of petroleum to this country is extremely remote, if it exists at all, and they may safely proceed in their laudable endeavors to provide a second string to their bow in the matter of staple material. Difficulties have arisen during the last few years in the coal market, and endeavors have been made to artificially inflate the price of certain cannels and other kinds of coal that are generally favored in gas circles. But the injury to gas finances has not been more than very temporary. The supplies of petroleum are certainly quite as safe and probably safer than those of coal, and certainly the fact that a few speculators have forced the price for a few days, is too trivial to be worth even taking into consideration, in connection with enrichment or water gas processes.

While writing of oil, attention may be directed to the experiences of Mr. Dexter at Winchester, as set forth in his presidential address, delivered at the meeting above alluded to. The authorities of this ancient city, for some reason beyond that of getting the cheapest and most satisfactory light, have preferred to illuminate their streets by means of oil lamps, which are decidedly of antique cast both in appearance as seen in the day time, and as regards the dismal glimmer they afford at night. Some say that, as they claim to represent one of the most ancient cities in the world, having flourished before London or Rome were thought of, they have desired to recall prehistoric times so far as the street lighting is concerned. However this may be, Mr. Dexter candidly gives his experiences in one of those exceptional cases, in this country, where the gas company have failed to secure the street lighting; and they deserve very attentive consideration. He argues that, even if the public lighting yields little or no profit, and causes a lot of trouble, it does not follow that the company would be as well without it.

Apart from the question of profit and loss, it seriously affects the revenue through its influence upon the estimation of the public. Discontented customers find a strong confirmation as to the reality of their own grievances, in the action taken with regard to public lighting. After experiences with bad and leaky fittings and burners that fail to develop more than a small fraction of the illuminating value of the gas, they naturally conclude that what is best for the streets is best for them.

The probability is that having decided on this course, the oil lighting compares favorably as to cost with the previous gas bills, for the simple reason that the latter were two or three times as much as they should or need have been. A man who is prejudiced against gas, though he has never tried it, is bad, but an experienced user, who has found oil better or cheaper, is worse. Newcomers to the city, continued Mr. Dexter, find in the use of oil in the streets a reflection upon the gas company, and some would-be residents have reconsidered and gone elsewhere, thinking that possibly the sanitary measures, the conveniences and enterprise generally of the place would be on a par with the public lighting. For these and other reasons Mr. Dexter counsels that the gas company should not let the public lighting go into other hands if they can possibly avoid it.

These are timely words. Perhaps not so necessary now as at a period of 25 years back or so, but nevertheless well worthy our attention. The person who has tried both oil and gas, and prefers the oil, is a power to be reckoned with, apart from questions of street lighting. It follows that the gas company may spend money in worse directions than the education of the gas consumer. If it pays to have a cookery demonstration to illustrate the use of gas cookers, why should it not pay to advertise the best ways of burning gas. Yet many who show praiseworthy efforts in connection with cookers, are satisfied to leave the most important branch of their business to take care of itself. The man who has used gas will never become entirely extinct, but we must get rid of him as far as we can.

A somewhat interesting legal point in connection with the mantles sold by the Incandescent Gas Light Company was decided at the High Court of Justice a few days ago. It is well known that the patent rights are vested in the mantle only, and that there is no special feature about the burner. The Incandescent Company, looking at the fact that the cost of renewals would certainly be frequently discussed, decided that the wisest plan for exploiting their invention was to sell the burner and mantle complete at a price that would include profits and royalties, and to supply mantles for subsequent use at the lowest possible price. But to protect themselves against parties who might buy mantles only, and thus obtain the benefits of the invention without any consideration for royalty, etc., they have adopted an elaborate system of appointing agents in every town, and every box of mantles is stamped with the following condition: "The license to use this mantle is strictly limited to the person or persons purchasing the same, or on whose behalf the same is purchased from the company or their agents, and it is purchased and sold at the reduced price of 1s. 3d. on the express condition that it is only to be used for the purpose of renewal, and not in connection with burners or apparatus not sold or supplied by the company." The company found that this condition was being infringed by an ironmonger residing at Sandown, Isle of Wight, and took action against him. The evidence showed that the defendant, who was for some time an agent for the company, but had closed his connection with them for two years, authorized a friend residing in London to call at the office of the London agents for the sale of these appliances and purchase six dozen mantles. This commission was duly carried out, and on giving his address, which was within the limits of the district assigned to the agent, the friend was supplied with the mantles, paid for them, and had them consigned direct to the defendant at Sandown. This gentleman, on receiving the parcel, simply posted a trade label over the notice above quoted, and retailed the mantles together with another make of burner. The defense raised was that he had no knowledge of the existence of such a condition until he saw it on the boxes after having paid for the same; that as no such condition was in existence at the time when he acted as agent for the company he could not be expected to be aware of it; that, had he known of such a condition, he would not have purchased the mantles, as they would be useless to him, and that his reason for sending to London instead of purchasing from the local agent was because the latter would only allow him a small commission off the retail price.

The Judge decided for the defendant and against the company. But his reason for this decision was that the sale was completed by consigning the goods and receiving payment for them, and that previous to such completion no notice of the condition in question had been furnished to the defendant or to his agent. Unless the special conditions were set forth at the time of sale, so that the purchaser could either accept them or retire from the purchase, he was considered to have made a free bargain, and could use the goods in any way he chose. But this did not affect the right of the sellers to put any restrictions they pleased on the use of their goods, and of enforcing such restrictions if they wished to do so. He was satisfied that the defendant was not aware of the restriction, and that in purchasing the mantles direct from London through a friend he was not resorting to a trick for evading or getting around that restriction.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

LAST week we reported the reduction recently ordered in the gas rate at Lawrence, Mass., and now we are enabled (through the courtesy of the Company) to print the text of the circular, compiled by Agent Humphreys, announcing the concession to the residents of Lawrence:

"OFFICE OF THE LAWRENCE GAS COMPANY,
"LAWRENCE, MASS., May 18, 1895.

"Gas consumed on and after June 1st, until further notice, will be charged at $1.50 per 1,000 cubic feet, subject to a discount of 20 cents per 1,000 cubic feet if the bill is paid by the 15th inst., provided no previous bills remain unpaid. This leaves the net price $1.30 per 1,000 feet. In this connection I desire to call your attention to the fact that at this low figure gas is a cheap illuminant. I say low figure, because when it is considered how far Lawrence is from the coal mines—how long a haul is required to bring coal to this point; and when the uncertainty of this business in a manufacturing city like Lawrence is considered—where the smallest business depression affects instantly the gas consumption—the rate is one which leaves but a scant margin of profit. When it is remembered that the price of oil has advanced lately, it would be more readily granted that gas, when properly used as an illuminant, has both convenience and economy to commend it. Some customers use gas generally for lighting purposes throughout the house, save for reading purposes, and we would call the attention of such of our customers to the advantages of the Welsbach burner for such purpose. It makes a very steady and exceedingly economical light. I would again call the attention of our customers to the necessity of using good gas burners and keeping them clean. The same remark applies to globes, which should have an opening four to five inches, and should be of fairly clear glass; colored globes, while giving a pretty effect, obstruct a great deal of the light. We have often called your attention to the great advantage of gas for cooking purposes. A gas stove is now considered a necessary part of a kitchen outfit, as is evidenced by the large number of stoves we have sold during recent years. Gas for cooking, when properly used is economical; it is clean; it is convenient; by its use the horrors of a hot kitchen in midsummer are avoided. You may always obtain just the heat desired at the exact time it is needed. You have no bother with coal, or kindlings, or ashes. The turning of a tap, with the application of a match, gives you the heat required. Of recent years many improvements have been made in the gas stove, both in the direction of economy and improved service, so we are now able to show a fine line of stoves. For the month of May we made the offer that we would put up a gas stove for trial for the month, to be removed at our expense, at the end of that time, if our customers so desired. This offer met with such ready acceptance that we have decided to repeat it for the month of June, and we now offer to put you in a gas cook stove on trial for the month of June, to be removed by us if you so desire any time during the month, we to make no charge for the stove if you decide to return it during the month. If you are so fixed that you cannot use a large gas cooker, we would suggest you try a small portable stove, which can be placed on a table or other convenient stand.—C. J. R. HUMPHREYS, Agent."

GOVERNOR GREENHALGE, of Massachusetts, has signed the bill permitting the Brookline Gas Light Company to lay its pipes under Fort Point Channel, and thus is ended a contention that cost quite a bit of good money—most of which went to the lawyers.

COL. B. O. JAMES, acting as attorney for Mr. M. A. Hankins, has applied to the City Council of Manchester, Va., for the right to construct and operate a gas plant in that city. Eventually Manchester will have a gas works.

AT the annual meeting of the Atlantic City (N. J.) Gas and Water Company, the officers chosen were: Directors, J. A. Barstow, Thomas K. Reed, Frederick Hemsley, Joseph H. Borton, John Roberts, Wm. L. Elkins, S. Bradley, Charles Evans, Geo. Graham, John E. Mehrer, John McManes, Hamilton Disston and T. K. Wagner; President, Joseph A. Barstow; Secretary, Thomas K. Reed; Treasurer, Joseph H. Borton. A semi-annual dividend of $1 per share was declared, which is equivalent to a per annum rate of 8 per cent. The Company's Michigan avenue plant is being enlarged.

A CORRESPONDENT forwards the following from Salt Lake City, Utah: "The business established at 74 West Second South street by the Salt Lake and Ogden Gas and Electric Light Company, as a show and sales room of gas stoves and ranges, has been sold out to Mr. Richard A. Keyes, of Salt Lake, who proposes to continue the business on the lines

on which it was first established. In acquiring the stock and goodwill of the Gas Company Mr. Keyes also assumed some obligations whereby he is virtually under contract to push the business for all it is worth. He will consequently devote his entire time and attention to it, and from his past experience in a kindred line he ought to be able to make the public take kindly to gas stoves. In addition to stoves, ranges, grates, etc., Mr. Keyes' new quarters will be the depot for the special burners used for lighting with natural gas.—T. S."

THE proprietors of the Elyria (Ohio) Gas and Water Company have offered to dispose of their works complete to the local authorities, at a price to be fixed by five arbitrators.

THE Universal Gas Construction Company, of Chicago, has filed a bill in the Superior Court of that city against the Universal Gas Company, also of Chicago, to restrain the latter from operating under the named title. Complainant avers that it was organized in 1892, while defendant was not in existence prior to 1894, wherefore defendant is charged, through the similarity of title, with "living like a parasite upon the corporate life of the complainant."

THE Wilmington (Del.) Coal Gas Company will add several miles of pipes to its main system this year.

MR. JOHN BECKENBACH, a resident of Palmyra, N. J., and who had seen 30 years of service in a foreman's berth in the Philadelphia gas works, is dead. He was in his 82d year.

THE Asbury Park (N. J.) Council is inclined to renew the charter of the local Gas Company for a period of 30 years, if the Company will agree to furnish gas free to all the public buildings of the Borough. The condition looks to be an onerous one, yet we are told that Mr. Hodges, of the Company, is inclined to favor it.

THE new refrigerating plant for the International Cooling Company, at Atlantic City, N. J., will be designed and built throughout by the Berlin Iron Bridge Company, of East Berlin, Conn.

ACCORDING to the Long Branch (N. J.) *Record* of May 24th, the Consolidated Gas Company, of New Jersey, is the name of a new company which has been organized by consolidating the Gas Companies of Long Branch and Red Bank. Mains are to be laid through Shrewsbury, Fair Haven, Oceanic, Sea Bright, Little Silver and Rumson Neck. The Company made application some days ago to the Shrewsbury Township Committee for permission to lay mains in the roads of the township, which permission was granted. The Company's application for a similar right for Sea Bright is before the Borough Commissioners of Sea Bright. The Company agrees not to charge more than $2 per 1,000 cubic feet for gas furnished anywhere in Shrewsbury township.

AT the annual meeting of the Natural Gas Company, of West Virginia, the headquarters of which Company are in Wheeling, General Manager George Heard said that the Directors and shareholders were discouraged over the outlook, and he doubted if the effort to keep up the natural gas supply would be continued unless a better price could be obtained for it. He averred that natural gas cannot be sold at a profit for 15 cents per 1,000 cubic feet, which averment was based on the Company's experience gained through 8 years' actual working.

THE proprietors of the Malden and Melrose (Mass.) Gas Light Company offer to the shareholders (at $120 per share) of record their pro rata of 150 shares of new stock, the right to subscribe expiring on June 15th. The price was fixed by the State Board of Gas and Electric Light Commissioners.

THE property, real and personal, together with all the rights, franchises, etc., of the Belfast (Me.) Illuminating Company, have been transferred by the International Trust Company, of Boston, to the Belfast National Bank and Belfast Savings Bank. The Trust Company, trustees under a mortgage, came into absolute possession of the property April 25th, and have now transferred their interests to the named banks, which held $30,000 of the Illuminating Company's bonds. The property includes the plant and apparatus of the Belfast Gas Light Company, the machinery, poles, wires, etc., of the Electric Light Company, the lease of what is known as the Goose River power, and all the rights and privileges appertaining thereto. The business will be continued under its present management.

SUPT. FRANK N. DAVIS, of the St. Croix Gas and Electric Light Company, of Calais, Maine, is pretty busy just now overlooking important main extensions. Mr. Davis says there's nothing the matter with the gas business in his section of the Pine Tree State.

ABOUT the middle of May papers were filed incorporating the Provident Gas Company, of Springfield, Ills., the subscribers to the stock and the incorporators of the concern being named in the articles as follows: F. W. Tracy, R. D. Lawrence, J. C. Klaholt, E. A. Wilson, S. Brown, B. H. Ferguson, E. D. Keyes, P. W. Harts and Jno. C. Snigg. Right on the heels of the incorporation came an application to the City Council for a franchise, and a suspiciously speedy special meeting of that body was convened for May 20th, at which the full Council was present. The action then taken is best explained by the following summary forwarded by a correspondent: "The ordinance granting the new Gas Company the right to use the streets and alleys was passed by a vote of 13 to 1, Ald. Striffler voting in the negative because, he said, he had not opportunity to sufficiently acquaint himself with the provisions of the ordinance. The text of the original ordinance was amended, requiring that, if the ordinance be valid, the Company must accept it within 30 days, instead of 90 days, as was proposed originally. It was required in addition that the Company give a bond of $50,000 within 30 days after the passage of the ordinance instead of 90 days. The franchise gives the usual privileges contingent upon the fulfilment of all precautionary conditions on the part of the Company. The Company agrees to furnish an illuminating gas which shall average through the month 22 sperm candle power, burning 120 grains per hour, to be determined on a public photometer located in the City Hall. The maximum price to be charged for illuminating gas is 85 cents per 1,000 cubic feet, and 65 cents for fuel gas. The city reserves the right to compel the Company, in addition to furnishing gas for its street lamps, to light the same and to provide them with boulevard lanterns, at the rate of $12 per lamp per annum. During the first five years of the Company's business it shall pay 1 per cent. of its gross earnings into the city treasury, and after that period 2 per cent., so long as it shall do business under this contract. At the end of 20 years (the life of the franchise) the city is given the right to purchase the plant outright, at a valuation." We do not comprehend the full significance of this "Provident" grab; but we have a faint idea that the old Springfield Company can easily provide fair marching music for the Provident privateers.

THE proprietors of the Waltham (Mass.) Gas Light Company have brought suit against the Clements Brothers, who constructed a system of sewers for Waltham, the damages asked amounting to $10,000. The complaint alleges that through the negligence of the sewer builders the Company lost fully the sum asked for, in the instance of fractured mains and services and escapes of gas therefrom. The Company has a strong case, and the arguments are being made before Judge Luce.

MESSRS. WILLIAM H. GOSTLIN, T. E. Bell and N. P. R. Hatch have incorporated the Hammond Gas Company, to operate in Hammond, Ills. It is capitalized in $150,000.

CONGRESSMAN J. F. ALDRICH, of Chicago, wants a franchise for an electric lighting plant for Peoria, Ills. He says that if the Council will license his Company for 20 years, he will agree to establish a plant up to maintaining 400 arcs of 2,000-candle power each, and will furnish arcs on public account at the rate of $75 each per annum, on a lighting service based on the Philadelphia moontable, or will furnish them on an all night and every night table for $78.66 per lamp per annum. If the authorities are disposed to encourage Mr. Aldrich we submit they ought to take up the all night and every night proposition.

THE annual meeting of the Red Wing (Minn.) Gas and Electric Company resulted in the election of the following executive management: Directors—John Nelson, John Hack, J. C. Pierce, T. B. Sheldon and A. W. Pratt: President, T. B. Sheldon; Vice-President, John Hack; Secretary, C. F. Hjermstad; Treasurer, W. H. Putnam; General Manager, J. C. Pierce; Superintendent, John Nelson.

MR. P. J. Boyle, who is well known to Eastern gas men from his connection with the Newport (R. I.) Gas Light Company, has been elected Mayor of Newport, at a special election called to vote a successor to the late Mr. John Waters. Mayor Boyle was born in Newport 35 years ago, and has served several terms in the city's Councils.

Amongst the sufferers from the recent extensive conflagration at St. Albans, Vt., we regret to name the St. Albans Gas Company, which is said to have sustained damages amounting to $2,200.

THERE is no doubt that the gas war at Terre Haute, Ind., is over, for Messrs. Lee Williamson and J. A. Marshall have made a complete appraisement of the belongings of the Citizens Fuel Gas Company for the purposes of the capitalists who propose to restore the business of gas supply in Terre Haute to a fair commercial basis.

THE AMERICAN GAS LIGHT JOURNAL

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MONDAY, JUNE 3, 1895.

The Paper Awarded the First Prize in the Cicero (Ills.) Competition.

By MISS AMY FARLEY.

[The following is the text of the paper which was awarded the first prize in the competition instituted by the proprietors of the Cicero (Ills.) Gas Company for the best original article descriptive of the merits of cooking by gas. For the conditions of the competition see JOURNAL, May 27, p. 773.—ED.]

No one more fully appreciates the comfort and convenience of gas as a fuel for cooking than the housekeeper who makes the change from a coal stove to a gas range. The dust and care of ashes, the tiresome waiting "for the fire to burn up," the difficulty of maintaining an even temperature for cooking, the unnecessary heat for hours after the need for it is past, all these things are done away with by the use of the simple, clean and convenient gas range in place of the out-of-date and cumbersome coal stove.

Considered merely as a labor saver and a time saver, the gas range is priceless in its value to the housekeeper. A turn of the stopcock and a touch of the match, and the fire is ready, hot and steady, with no delays, no dirt, no fuss of coal and kindlings. The cooking done and the gas shut off, the range immediately cools, and needs no more attention. The advantage of being able to stop the heat when the work is done makes the gas range an ideal summer stove, for who does not know the discomfort of a coal stove breathing fumes and fire from every pore on a scorching August day?

The ease with which an exact degree of temperature is obtained must be counted as one of the greatest conveniences of a gas range. With her eyes on the bubbling contents of kettle or saucepan, the housekeeper regulates the flow of gas until the cooking is done as fast or as slow as she likes. In the oven this advantage is still more apparent. With a gas range in the kitchen, the day of sodden pie crust and burnt bread is past. In a temperature exactly adjusted to the degree of heat required, the baking is done with perfect evenness, with results satisfactory both to the cook and to those to whom she caters.

In no way is a gas range more valuable than in its use in the heating of irons. No heat is radiated, the irons are soon hot, and only those who have done the hard and warm work of ironing in a kitchen with an overheated coal stove can fully appreciate the difference in the two methods of work.

Every housekeeper knows how often in the exigencies of home life there suddenly arises the need for a little fire, but only those who have gas ranges in their kitchens know how easily this need is supplied. A late supper, or an early, hurried breakfast, a sudden illness in the night, a little hot water or a hot flat-iron, a cup of warm milk for the baby, all these things are quickly and simply met with the aid of the invaluable gas range. Hot water in large quantities at any time is only a matter of a half hour or so.

We have already referred to the excellence of gas range cooking, and this is well known to those who have tried this useful method in their homes. The skillful cook fears no failure with so faithful a helper as the incomparable gas range, and the result is a tempting array of "gas"-tronomical delicacies.

The Market for Gas Securities.

Consolidated made a new record during the week, as sales were completed to-day (noon of Friday) in it at 146. The happenings of the week prove our statement in the last issue of the JOURNAL that all active competition between the Equitable and Consolidated Companies was at an end. This sensible determination means the saving of a good round sum each year to the Companies, and also paves the way for sounder confidence in them on the part of the consumers. Perhaps Mr. Sage's Company (the Standard) will eventually come into the agreement for harmony, whereupon there will not be much difficulty in quieting any unreasonable action on the part of the New York and East River—the Mutual folks have been on the fair side for over 10 years. In our belief Consolidated is likely to experience a further and pronounced rise in value, and there is no blinking the fact that an increase in the dividend rate within the half year is much more than a probability. Mutual is bid for at 170, and it requires not the faith of a prophet to predict that it is to go still higher. Equitable is close to the 200 mark, and Standards (common and preferred) are in good demand at advancing figures.

Brooklyn shares are dull and strong, and Nassau possibly leads in the quotations. The details of the agreement over there may be looked for now at almost any time. Chicago gas is a shade easier, but values in this security seem to have been determined by investors at the 75 notch. Bay States are limp, while Lacledes are strong and are likely to go higher. Western, of Milwaukee, holds its advance, and Jersey City (N. J.) gas securities of all classes are very firmly held. One mystery of the market is juggling with Detroit gas, which is bid for at 28, but on what equivalent of value that quotation is based we are at a loss to discover. One certain thing is that did we hold any of it the 28 bidders could speedily acquire it.

Gas Stocks.

Quotations by Close & Nash, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

JUNE 3.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,480,000	100	145¾	146
Central	500,000	50	140	..
" Scrip	220,000	..	100	..
Equitable	4,000,000	100	196	..
Bonds, 6's	1,000,000	1,000	..	..
" 1st Con. 5's	2,300,000	1,000	111	112
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	170	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	..
Northern	150,000	50	90	91
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	29	31
Preferred	2,000,000	100	50	51
Bonds	3,500,000	1,000	88	89
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	..	..	..
Standard	5,000,000	100	54	..
Preferred	5,000,000	100	102	..
Bonds, 1st Mortgage, 5's	1,500,000	..	105	106
Yonkers	.....	50	101x	.
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	125	..
Citizens	1,200,000	20	65	..
" S. F. Bonds	220,000	1,000	..	101
Equity	2,000,000	10	..	..
" Bonds	1,000,000	..	..	..
Fulton-Municipal	3,000,000	100	175	..
" Bonds	300,000	..	108	..
Peoples	1,000,000	10	90	.
" Bonds, 7's	368,000	..	100	..
" " 6's	94,000	..	98	100
Metropolitan	870,000	100	170	..
" Bonds, 5's	70,000	..	..	..
Nassau	1,000,000	25	200	..
" Ctfs.	700,000	1,000	99	100
Williamsburgh	1,000,000	50	200	..
" Bonds	1,000,000	..	107	110
Out-of-Town Companies.				
Bay State	5,000,000	15	20¾	22
" Income Bonds	2,000,000	1,000	31	31½
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	75¾	77
2d " " "	3,000,000	1,000	55	57
Buffalo Mutual	750,000	100	120	..
" Bonds	200,000	1,000	95	100
Chicago Gas Co.	25,000,000	100	74	74¼
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds	7,650,000	1,000	98	98½
Columbus	1,000,000	..	..	..
1st Mortgage	1,085,000	..	..	..
Consumers. Jersey City	2,000,000	100	75	80
" Bonds	600,000	1,000	97	99
Cincinnati G. & C. Co.	7,000,000	100	..	90¾
Consumers, Toronto	1,800,000	50	18½	187
Central, San Francisco	.....	..	90	100
Capital, Sacramento	.....	..	..	50
Consolidated, Baltimore	11,000,000	100	61½	62
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	28	..
" Con. Bonds	4,312,000	..	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	75½	..
" Bonds	2,000,000	..	68¾	
Hartford	750,000	25	120	128
Indianapolis	2,000,000	..	130	142
" Bonds, 6's	2,650,000	..	102	..
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	86	..
Bonds	1,000,000	1,000	86	..
Louisville	2,570,000	50	..	130
Laclede, St. Louis	7,500,000	100	30½	32
Preferred	2,500,000	100	93	93½
Bonds	9,084,400	1,000	95	95½
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	208
New Haven	.....	25	200	..
Oakland, Cal.	.....	..	42½	43
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105

Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	81	..
Consolidated 5's	2,000,000	..	87⅛	90
Syracuse, N. Y.	500,000	25	..	..
San Francisco, Cal.	10,000,000	100	72¾	73¼
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	59	..
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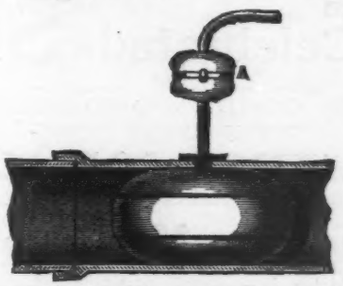

These Gas Bags are used to stop the flow of gas while repairing or making alterations in gas mains. There have been numerous cases of workmen being badly injured, and sometimes fatally, by the escape of gas resulting from the bursting of a bag, and our patent improvement is designed to obviate such calamities. The indicator *A* shows unerringly when the bag has been sufficiently inflated to pack the main, and when the pumping should be stopped. Our Bags are made of a rubber stock especially prepared to admit of great distension, and to resist the action of Oils, Gases, Naphtha and other residuum in the mains, and they are made with lapped joints, which adds greatly to their strength.

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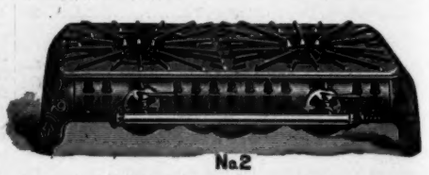

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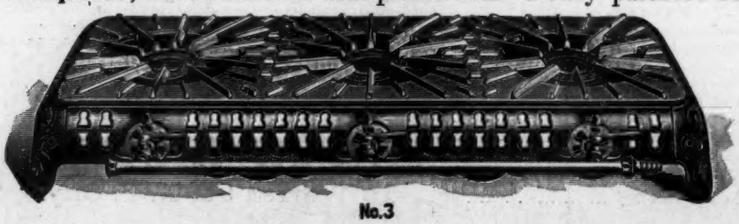

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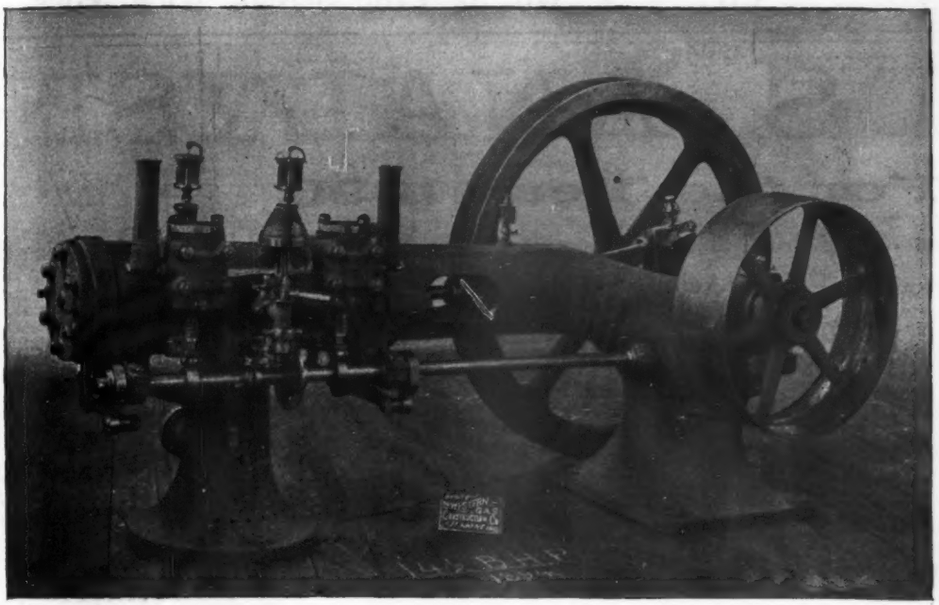

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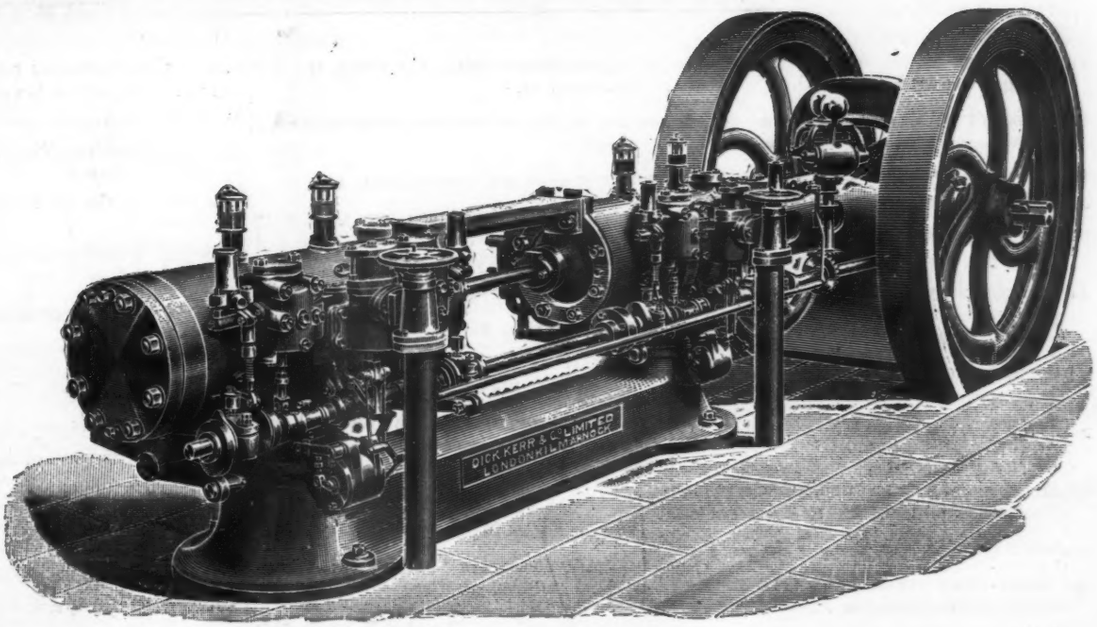

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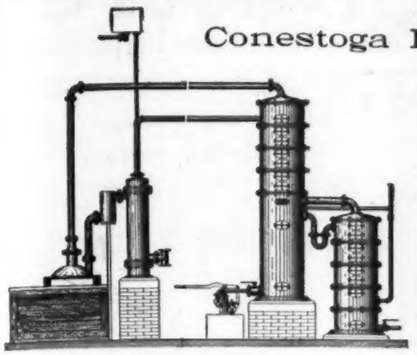

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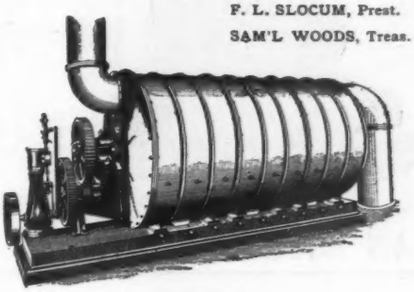

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THE LITTLE GIANT (AN IMPROVEMENT ON THE LOWE) GENERATOR.

Can be put into Coal Gas Works at a price the interest on which will not be so much as their present repair account.

This Generator is now in use in nearly every State in the Union, and everyone using it will recommend it to you.

It makes a faultless gas from whatever gas-producing materials are cheapest in the locality where required, using hard coal or coke in connection with Lima crude or any other crude petroleum or its distillates, including *Naphtha of any specific gravity.*

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Why struggle day and night, year after year, with high priced, low candle Coal Gas; with choked standpipes, broken retorts, naphthaline, and interminable other troubles and delays, while it is so easy to make an entirely better gas for less money in a quarter of the time, and having none of these drawbacks?

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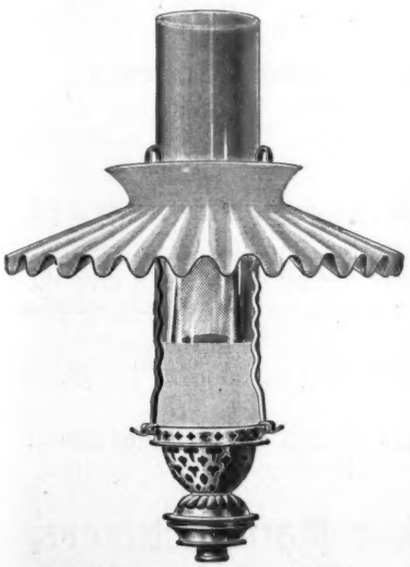

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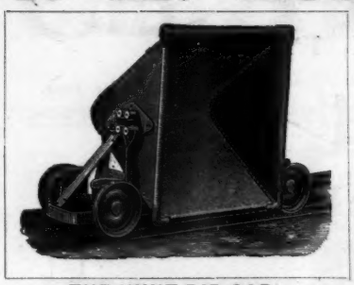

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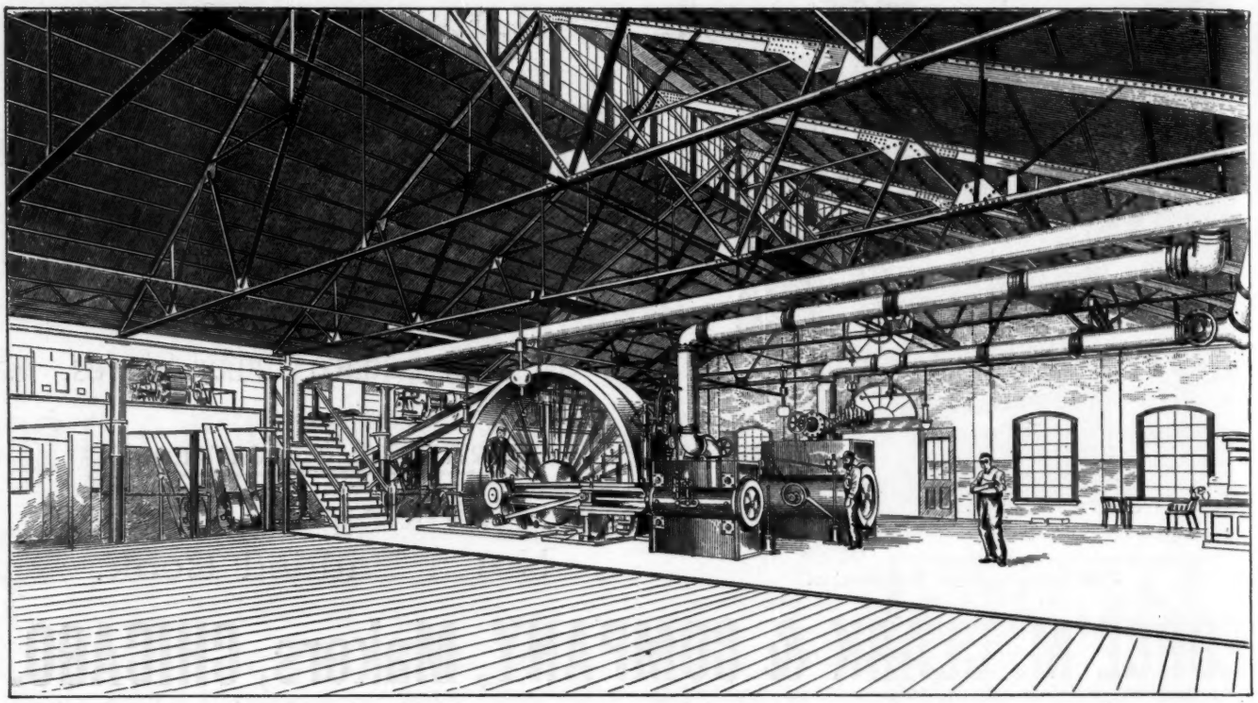

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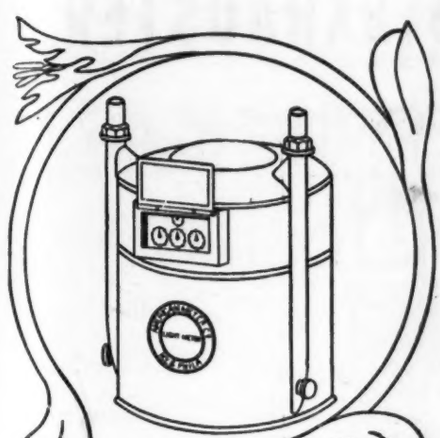

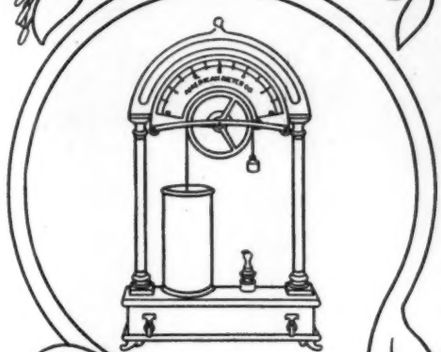

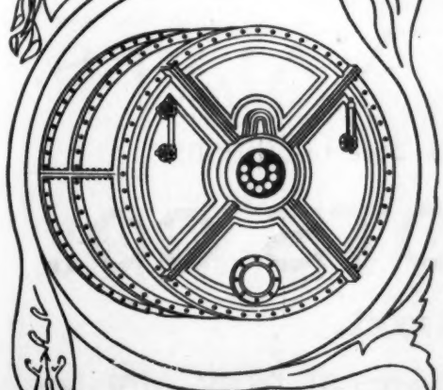

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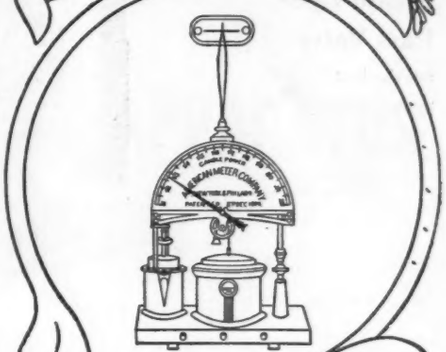
PUBLIC LIGHTING TABLE.

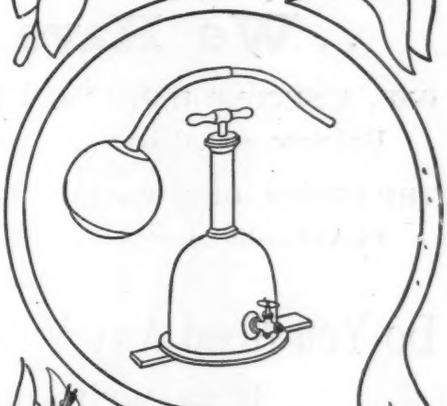
JUNE, 1895.

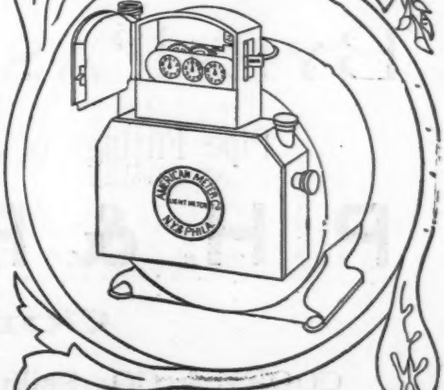
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Sat.	1	12 20 AM	3.30 AM	7.15	3.15
Sun.	2	12.50	3.30	7.15	3.15
Mon.	3	1.10	3.30	7.15	3.15
Tue.	4	1.50	3.30	7.25	3.15
Wed.	5	2.20	3.30	7.25	3.15
Thu.	6	No L.	No L.	7.25	3.15
Fri.	7	No L. FM	No L.	7.25	3.15
Sat.	8	No L.	No L.	7.25	3.15
Sun.	9	8.00 PM	10.50 PM	7.25	3.15
Mon.	10	8.00	11.30	7.25	3.15
Tue.	11	8.00	12.00 AM	7.25	3.15
Wed.	12	8.00	12.20	7.25	3.15
Thu.	13	8.00	12.40	7.25	3.15
Fri.	14	8.00	1.00	7.25	3.15
Sat.	15	8.00 LQ	1.20	7.25	3.15
Sun.	16	8.00	1.40	7.25	3.15
Mon.	17	8.00	2.10	7.25	3.15
Tue.	18	8.00	2.30	7.30	3.15
Wed.	19	8.00	3.30	7.30	3.15
Thu.	20	8.00	3.30	7.30	3.15
Fri.	21	8.00	3.30	7.30	3.15
Sat.	22	8.00 NM	3.30	7.30	3.15
Sun.	23	8.00	3.30	7.30	3.15
Mon.	24	8.00	3.30	7.30	3.15
Tue.	25	8.00	3.30	7.30	3.15
Wed.	26	8.00	3.30	7.30	3.15
Thu.	27	10.10	3.30	7.30	3.15
Fri.	28	10.30	3.30	7.30	3.15
Sat.	29	10.50 FQ	3.30	7.30	3.15
Sun.	30	11.20	3.40	7.30	3.15

TOTAL HOURS LIGHTING DURING 1895.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	237.00	January	423.20
February	196.40	February	355.25
March	195.50	March	355.35
April	165.30	April	298.50
May	153.40	May	264.50
June	138.20	June	234.25
July	146.30	July	243.45
August	152.50	August	280.25
September	165.10	September	321.15
October	186.10	October	374.30
November	204.10	November	401.40
December	219.30	December	433.45
Total, yr.	2161.20	Total, yr.	3987.45







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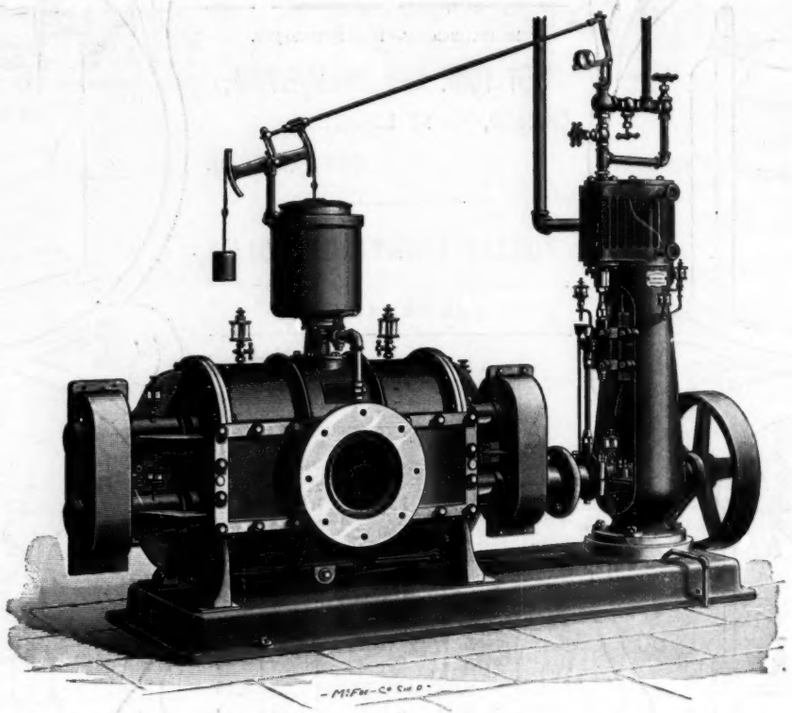

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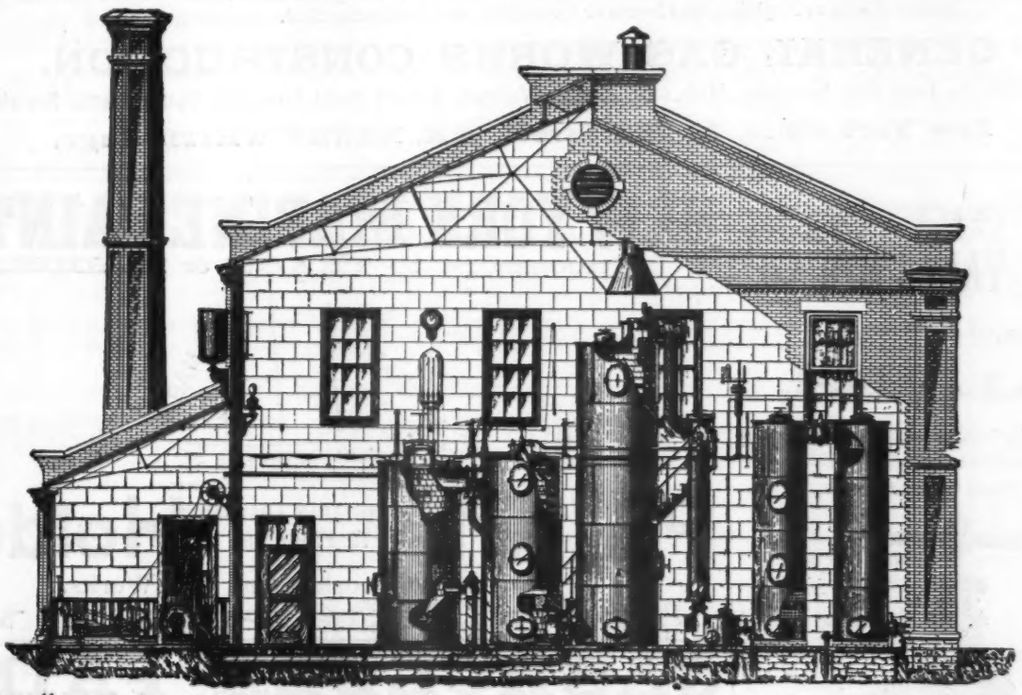

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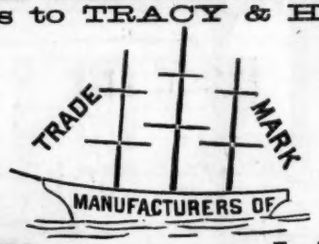

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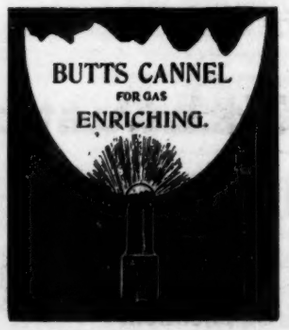

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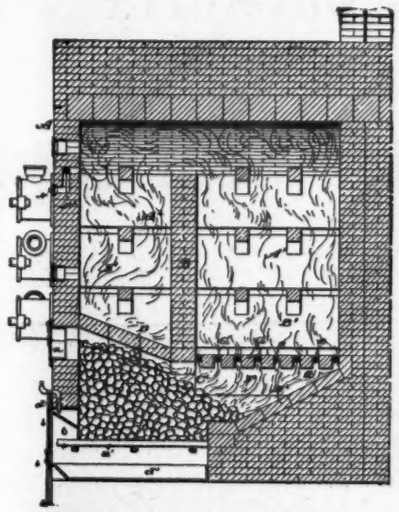

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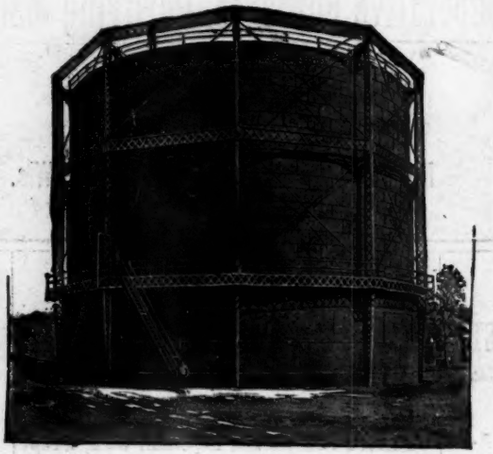

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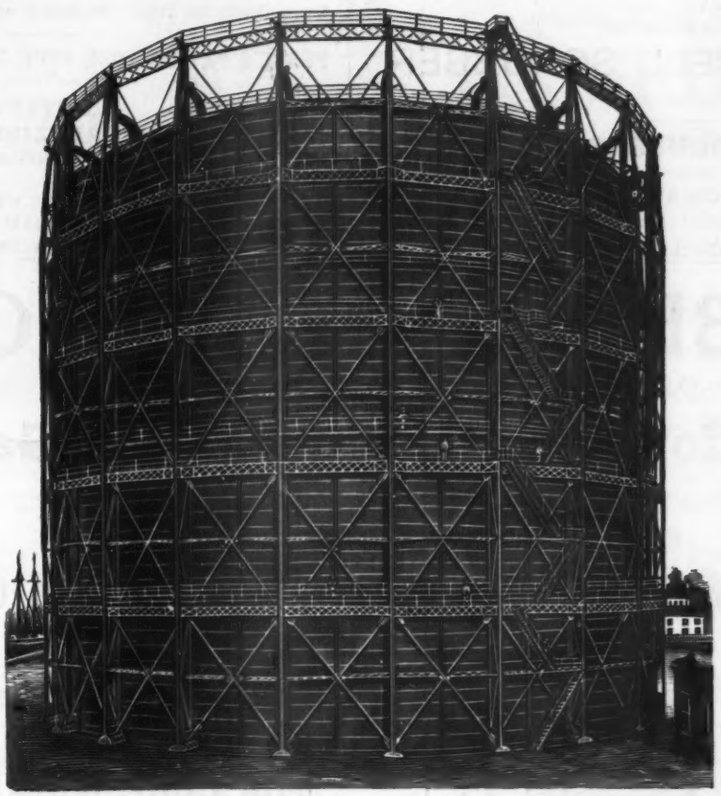

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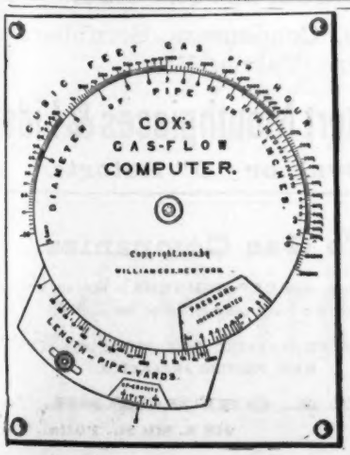

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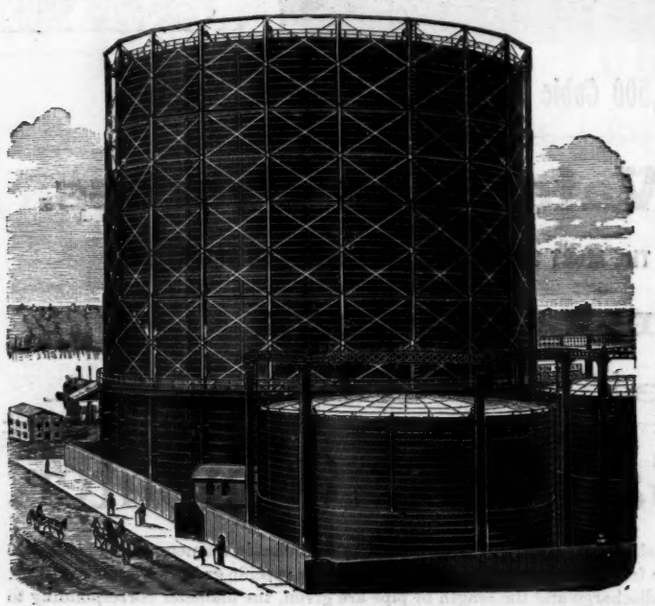

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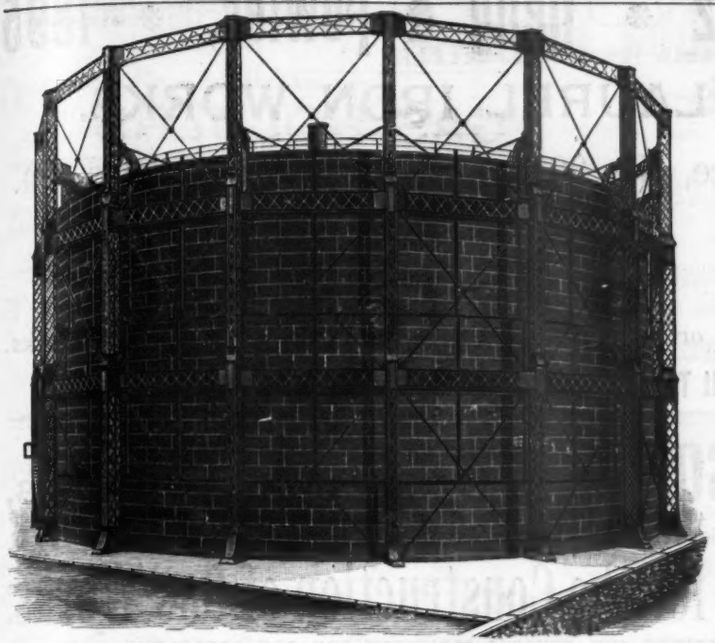

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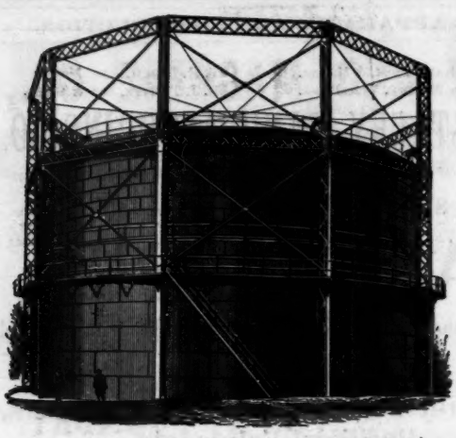

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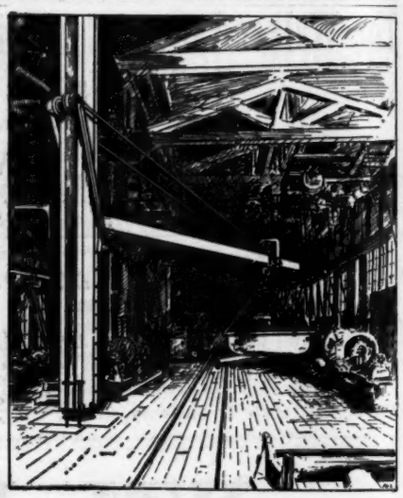

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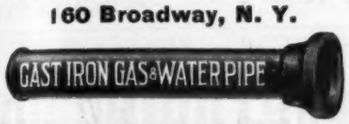

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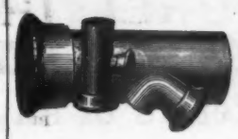

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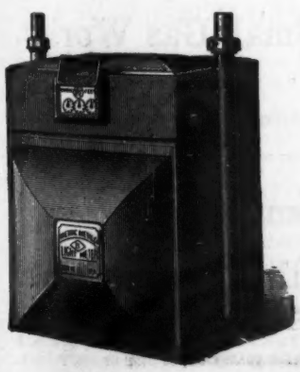

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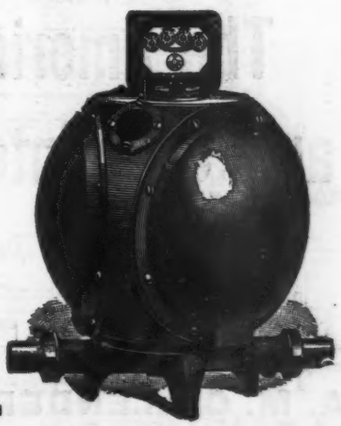

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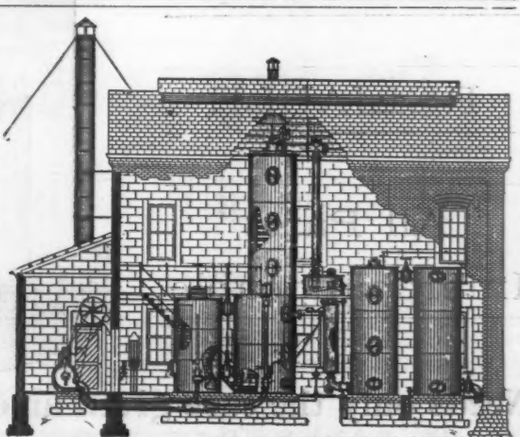

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